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ECONOMIC EFFICIENCY IN THE UTILIZATION AND IMPROVEMENT  
OF THE PUBLICLY OWNED PASTURELAND OF ALBERTA

by



KENNETH F. MILLER

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES  
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UNIVERSITY OF ALBERTA  
FACULTY OF GRADUATE STUDIES

The undersigned certify that they have read and recommend to the Faculty of Graduate Studies for acceptance a thesis entitled "Economic Efficiency in the Utilization and Improvement of the Publicly Owned Pastureland of Alberta," submitted by Kenneth F. Miller in partial fulfillment of the requirements for the degree of Master of Science.



## ABSTRACT

Projections of future demands for beef and also of 1980 cattle numbers indicate a substantial increase in the forage requirements of the cattle industry. Since existing pastureland is being fully utilized, this additional forage must come from increased pasture productivity and/or increased pasture acreage.

An inventory of Alberta's current (1966) government-owned pastureland acreage and production was made on a regional and provincial basis. This pastureland consisted almost entirely of unimproved native grass. In livestock operations the manner in which this public land is utilized in conjunction with private land was analyzed.

Operators' estimates of pasture improvements previously made and of potential for further improvement of both owned and leased pastureland were recorded. Factors influencing pasture improvement or the lack of it were investigated.

If improvement of pastureland is to be undertaken, either by the province or by individual operators, it must be undertaken on the basis of capital theory. A linear programming model was utilized to determine the most profitable (least expensive) method of improving Alberta's public pastureland. The restriction of the grazing season to mid-June until September would be an alternative method of increasing the productivity of the public grazing land.



## ACKNOWLEDGEMENTS

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## CHAPTER I

### INTRODUCTION

#### The Challenge

The agricultural industry in Western Canada is currently faced with one of the greatest challenges in its history. The challenge is to reallocate a significant proportion of its resources out of wheat production and into the production of other commodities while simultaneously avoiding a serious decrease in farm income. An increase in the output of beef cattle is one method of utilizing part of this "surplus" land. This increase would necessitate greater production of feed grains and hay or cultivated pasture.

It has been estimated that the Canadian demand for beef and veal will be 2,265 million pounds annually by 1980, an increase of 90 percent over the 1958-62 level of consumption. Taking into account development in technology and management which will increase the carrying capacity of native rangeland by 20 percent, a net addition of 11.0 million acres of improved forage land will be required to supply the estimated 49 percent increase in forage requirements.<sup>1</sup> Additionally there will be an increase in feed grain requirements of 2.9 million tons. This added grain consumption would account for the oat and barley production of 4.0 million acres.

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<sup>1</sup> L. E. Drayton et al., "Demand for Beef in 1980 and Related Land Requirements," The Economic Analyst, XXXIV No. 4 (1964), p. 77.



Viewing the situation from the supply side, Love<sup>1</sup> recently projected that by 1980 total Canadian beef production will be 50.9 per-cent greater than that of 1965. He also predicted a 93.5 percent increase in numbers of beef fed out in Alberta for the same period. Estimates for increases in the various types of Alberta cattle as well as forage consuming animal units are given in Table 1. This table shows an increase of 40.7 percent in the forage requirements in 1980 as compared to 1967 levels.

Table 1

FORAGE CONSUMING ANIMAL UNITS IN 1967 AND  
PROJECTIONS FOR 1980 - ALBERTA<sup>a</sup>

Type of Livestock	1967		1980	
	Number	Animal Units	Number	Animal Units
	in thousands			
Beef cows	1,056.0	1,056.0	1,568.0	1,568.0
Dairy cows	216.0	216.0	211.3	211.3
Yearling dairy & beef heifers	299.0	224.2	376.0	282.0
Yearling steers	350.0	262.5	437.5	328.0
Calves	1,105.0	- -	1,523.6	- -
Bulls	55.0	71.5	76.2	99.1
Total	3,081.0	1,770.2	4,192.6	2,488.4

Source: H.C. Love, "Determinants of Forage Use in Livestock Production of the Prairies - 1980," Proceedings, Canadian Forage Crop Symposium, Appendix Table 1 (Edmonton, 1969).

<sup>a</sup>Unless designated otherwise, tables in this thesis were derived from survey data.

<sup>1</sup> H.C. Love, "Determinants of Forage Use in Livestock Production of the Prairies--1980," Proceedings Canadian Forage Crops Symposium (Edmonton, 1969); pp. 437-461.



Clearly a physical potential exists for the growth of the beef industry. However, in the final analysis the extent of expansion of the Western Canadian beef industry will be determined by the industry's ability to compete in price with other potential suppliers of beef in North America, and to some extent, foreign countries.

Public grazing land is a major input segment in the beef industry. Currently 21.8 percent of all AUM's of grazing in Alberta is provided by public sources. Thus the management of the public grazing lands enables the provincial government to influence very directly the future of Alberta's beef industry. By implementing policies that are more consistent with the basic objectives of public land policy (as put forth by Wood), the provincial government can aid substantially the competitive position of the industry.<sup>1</sup>

Specifically these objectives are:

1. To prevent in the allocation and use of public land any undesirable soil deterioration through loss of the fund resources of the soil.
2. To strive towards maximum net returns in the use of the public land.
3. To allocate the land resources in the size of farm unit that will make it possible for the operator to attain a satisfactory level of living.
4. To adopt a type of land tenure that will assist in granting freedom, equity, and security to all who hold rights in land and that will aid in the realization of the first and second objectives.
5. To correlate the public land policy with the Provincial and Dominion agricultural policy.

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<sup>1</sup> V. A. Wood, "Public Land Policy for Alberta" (unpublished Ph.D. dissertation, University of Minnesota, 1954), p. 5.



An indication of the relative importance of livestock within Alberta's agricultural industry is given in Table 2. One can see the historic and the future importance of beef to the welfare of the people of Alberta.

Table 2  
CATTLE SALES AS A PERCENT OF ALBERTA FARM  
INCOME FOR SELECTED YEARS

<u>Year</u>	<u>Percent</u>
1940	9.6 <sup>a</sup>
1950	23.7 <sup>a</sup>
1960	33.4 <sup>b</sup>
1967	30.0 <sup>c</sup>

- Source:
- a Canada, Dominion Bureau of Statistics, The Canada Yearbook (Ottawa: Queen's Printer, 1940 and 1950), p.
  - b Canada, Dominion Bureau of Statistics, Census of Canada, Bulletin 5.3-3 (Ottawa: DBS, 1961).
  - c Alberta Department of Agriculture, Statistics of Agriculture for Alberta, 1966 and 1967 (Edmonton: Alberta Dept. of Agriculture, 1967).



## Objectives of the Study

This research was based upon three basic objectives. The first was to prepare an inventory of the total area and present capacity of all publicly controlled grazing land in the Province of Alberta. The second objective was to determine the optimum extent to which the productive potential of this natural resource could be increased by physical improvements.<sup>1</sup> Estimation of this potential involved collection of data on the cost and benefits directly due to increased productivity by each of the feasible improvement methods. An estimation of this type was computed for the seven grazing regions of the province. An investigation was also made of alternative methods of allocating this land to the public in order to best serve the objective of increasing Alberta's annual beef output. Finally, this information was incorporated into a linear programming model to determine the optimum pattern and rate of developing pastureland in the province's grazing regions. Recommendations based on these solutions were then made for administrative policies which would contribute to economic efficiency in the utilization and improvement of Alberta's public pastureland.

## Methodology

### The Sample

A total sample of 704 individuals was selected from the 1966 lists of patrons and lessees of grazing reserves, grazing associations,

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<sup>1</sup> The author gratefully acknowledges the cooperation and assistance of Wayne A. Fuller, Professor of Statistics, Iowa State University, Ames, Iowa, on this section of the thesis.



and grazing leases of the Department of Lands and Forests, and of the grazing leases in the Special Areas. Leases were aggregated as far as possible in order to permit sampling of individuals rather than leases. Individuals then were arranged by size of lease or allotment within towns and selected at the rate of one in 12. The sample was designed to provide maximum information at the least cost within the sampling environment. Additionally the 50 largest acreage leaseholders with the Department of Lands and Forests, the 25 largest acreage leaseholders in the Special Areas, and the 25 largest patrons of Department of Lands and Forests' grazing reserves and grazing associations were selected. These people were included in an attempt to maximize the amount of information obtainable from a limited sized sample. It was felt that these public land users would possess more information than less extensive operators because of their larger operations and greater experience with public grazing.

Six hundred and thirty-eight usable questionnaires were obtained for analysis. Sixty-six questionnaires were unobtained because the farm or the lease had been sold, there had been a recent death in the family, or the interviewee was unavailable or refused the interview.

### The Questionnaire

Besides a substantial amount of necessary data about the operator and his farm, specific information concerning pastureland productivity, use, and management was obtained from the questionnaire. One section was devoted to securing information on previous, current, and profitable types and acreages of pasture improvement. The final section was designed to obtain information on operator attitudes toward



various land administration policies.

#### Estimation--The Expansion Factors

To provide a meaningful analysis and also to complement phase one of the study, the sample was divided into seven relatively vegetatively homogeneous grazing regions. Farms with irrigated pasture (Grazing Region III in the earlier study by McMillan)<sup>1</sup> were not included as a separate region in this study.

As previously noted, the population was initially sampled at two different rates. Holders of the 50 most extensive grazing lease acreages in the Department of Lands and Forests and the 25 largest grazing leaseholders in the Special Areas, as well as the 25 patrons of grazing associations and grazing reserves utilizing the greatest amount of AUM's from public grazing lands, were selected with a certainty of one. This group was called the top 100. The remainder of the patrons of these three sources of public grazing were sampled at the rate of one in every 12 users. Upon examination of the data collected, it was found that some of the latter group had more than one source of public grazing and therefore had more than one opportunity to enter the sample. These operators were identified and given a weighting of one-half of that of the remainder of the sample. This sampling structure resulted in three separate groups, (1) the top 100, (2) the multiple users, and (3) the remainder: these groups were further divided into seven grazing regions, each with an appropriate expansion factor.

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<sup>1</sup> Melville L. McMillan, "An Inventory of Alberta's Pasture Resources and Estimated Potential Beef Production from the Improvement of Privately Owned Land (M.Sc. thesis, University of Alberta, Department of Agricultural Economics, 1967), p. 8.



Table 3

SAMPLE RESPONSE AND EXPANSION FACTORS  
BY SAMPLE GROUP AND GRAZING REGION

Grazing Region	I	II	IV	V	VI	VII	VIII	Province
Sample Group								
Multiple Users								
Selections	45	9	2	16	5	1	1	79
Responses	40	8	2	14	4	1	1	70
Expansion Factor	7.34	7.34	7.34	7.34	7.34	7.34	7.34	7.34
Top 100								
Selections	49	9	19	6	10	4	2	99
Responses	48	9	17	6	10	4	2	96
Expansion Factor	1.10	1.08	1.28	1.08	1.08	1.08	1.08	1.12
Remainder								
Selections	157	72	58	48	61	63	67	526
Responses	142	67	51	42	53	54	63	472
Expansion Factor	14.30	13.91	14.69	14.95	15.08	15.08	13.78	14.48



To compensate for non-respondents, the basic expansion factors were multiplied by the quotient of

$$\frac{\text{total number in sample group}}{\text{number of responses in sample group}}$$

in a similar manner these expansion factors were then adjusted slightly by weighting them with the ratio

$$\frac{\text{reported Department of Lands and Forests grazing lease acreage provincial total}}{\text{estimated Department of Lands and Forests grazing lease acreage provincial total}}$$

The ratio estimate adjustments had the effect of making estimated Department of Lands and Forests lease acreages agree with published data, but estimates for Special Area lease acreages were larger than those given in published records.



## CHAPTER II

### AN INVENTORY OF THE PUBLIC GRAZING LAND

The first objective of this study was to complete an inventory of the publicly owned grazing land in the province as of 1965. Compilation of this data proved to be difficult owing to the diversity of administrative offices and the lack of a uniform system for computing land productivity. However, the majority of the public grazing lands were administered on the basis of carrying capacities which were initially established through work done by the Canada Department of Agriculture at Manyberries and Swift Current research stations.<sup>1,2</sup> One long-term objective of public grazing land management has been conserving native forage cover while simultaneously obtaining an acceptable amount of animal product over an extended period of time. Grazing experiments determined that these ends were realized when approximately 55 percent of the grass was harvested through grazing and the remaining 45 percent left for seed production, protection from wind erosion, and as grass carry-over. Using this criterion, the Department of Lands and Forests and Special Areas administration have assessed the carrying capacity of their land to achieve this grazing rate over a period of time. Periodic inspection has been used to maintain this

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<sup>1</sup> S.E. Clarke, J.A. Campbell, and J.B. Campbell, Ecological Grazing Capacity of Native Grass Pasture, Bulletin #738 (Ottawa: Canada Dept. of Agriculture, 1942).

<sup>2</sup> S.E. Clarke, E.W. Tisdale, and N.A. Skoglund, The Effect of Climate and Grazing Pastures on Short Grass Prairie Vegetation, Bulletin #747 (Ottawa: Canada Dept. of Agriculture, 1943).



standard (overgrazing can be identified through a change in proportions of the original plant population).

Figure 1, a map of the grazing regions of the province as established by the Department of Lands and Forests, gives a reasonably accurate representation of the productivity of grazing land throughout the province because any individual tract of native grazing land of average topography in any of the zones will not vary appreciably from these rates when subjected to the test of time. Carrying capacity figures for an evaluation of the productivity of grazing land may be conservative in years of favorable climatic conditions and conversely may be overestimated in years of less favorable conditions<sup>1</sup> (Appendix 1, Table 42).

#### The Public Grazing Land

This study estimates a total of 12,112,800 acres of publicly owned grazing land in 1965 in the Province of Alberta. This land is administered by the Government of Alberta (The Department of Lands and Forests, Department of Municipal Affairs) and local governments and by the Federal Government of Canada (PFRA, Department of Indian Affairs, and

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<sup>1</sup> In this report an Animal Unit Month or AUM is considered to be the monthly grazing requirements for 1,000 lb. range cow. A month of grazing for various types of livestock have the following grazing requirements.

<u>Livestock</u>	<u>AUM</u>
cow and unweaned calf	1.0
yearling	.75
weaned calf	.50
2 year old	1.0
bull	1.3
horse	1.5
sheep	.2



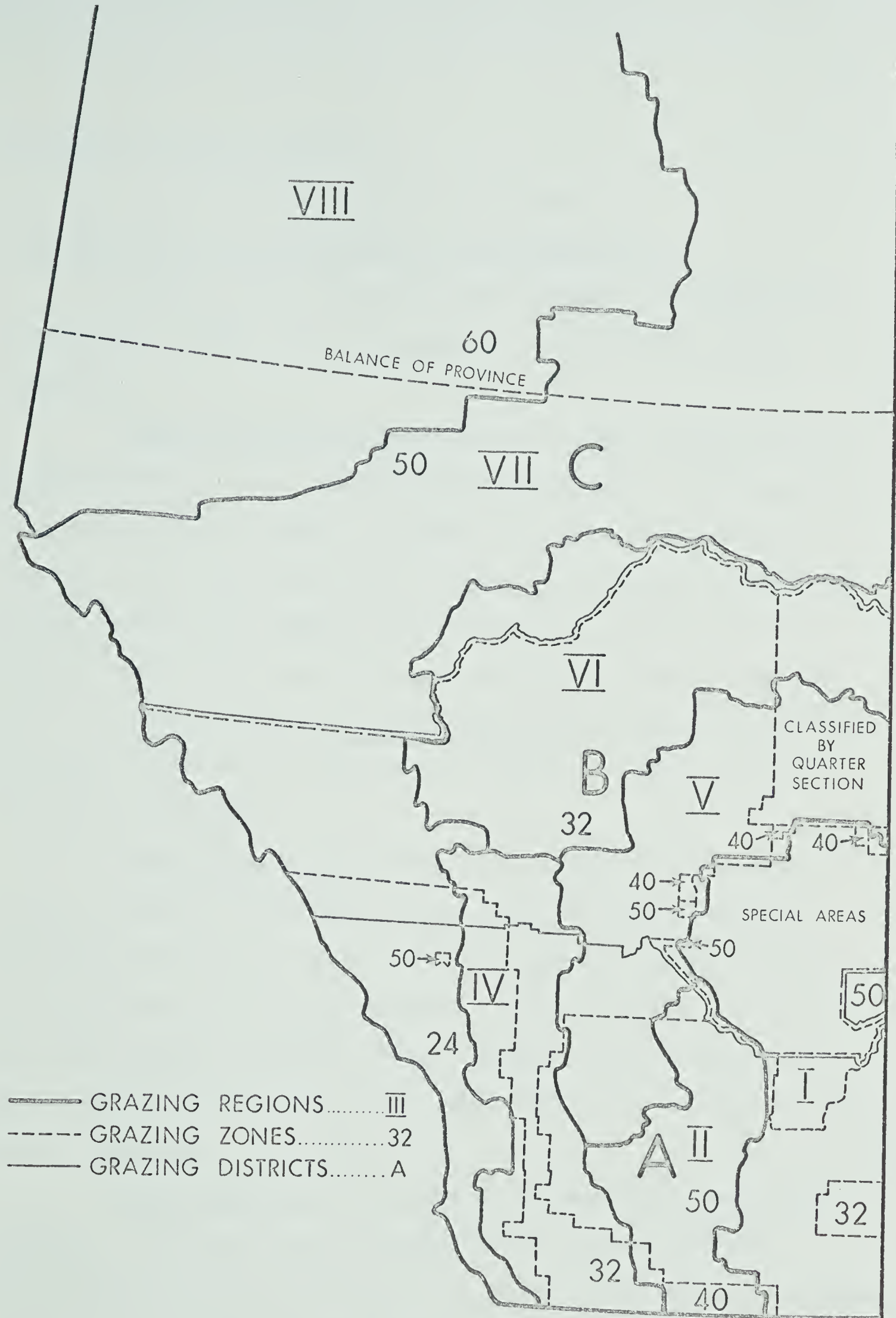


Figure I

GRAZING REGIONS, ZONES, AND DISTRICTS OF ALBERTA



Department of National Defense).

### Provincially Administered Grazing Land

#### Land administered by the Department of Lands and Forests

The Department of Lands and Forests managed 7,101,200 acres of grazing land in 1966. This acreage falls in the following leasing categories.

Individual grazing leases--These are leased to individuals for extended periods of time, usually either 10 or 20 years. The lessee has more or less complete managerial freedom over the lease with respect to grazing. As of June, 1967, leases of this type (including road allowance leases) accounted for 3,666,500 acres of grazing land; which, when multiplied by each tract's appraised carrying capacity, produced 1,038,900 AUM's of grazing annually. This AUM's figure may be slightly higher than the actual amount used in 1966 due to the addition of grazing leases in the Peace River Region.

Grazing Associations--Under this arrangement land is either leased to groups of individuals who have formed an association for an extended period of time, usually on a 20-year basis; (790,700 acres) or else grazed under annual grazing permits. The associations use this land for summer grazing, usually from May to October. In 1967, 884,500 acres were utilized in this manner and were calculated to have produced 213,900 AUM's of grazing.

Grazing Reserves--These reserves are operated to provide summer grazing. In 1966 they occupied 179,800 acres of land and provided 56,300 AUM of grazing, the actual amount of use since this land was rented to users on a per head per month basis. Of the ten grazing reserves,



four reserves east of Lethbridge use irrigated pasture in conjunction with dry land pasture.

Individual Grazing Permits--Grazing permits are essentially grazing leases issued to individuals on an annual basis. In 1966 there were 555,700 acres under this arrangement which provided an estimated 142,900 AUM's of grazing.

Head Tax Allotments--In a small portion of the wooded area of Alberta grazing associations and individuals grazed their livestock on a per head per month basis. The topography is such that an accurate acreage figure is not available. However, by applying the ascribed carrying capacity for the region to the 11,021 AUM's utilized, it was estimated that the equivalent of 37,200 acres were grazed under this lease arrangement. This acreage was the best estimate available for the 1966 use of such land.

Forest Reserve Permits--Cattlemen obtained 88,264 AUM's of grazing in 1966 on Forest Reserves according to the Forestry Division. Owing to a difference in methods used in calculating AUM (yearlings require .67 AUM per month rather than .75 AUM), this figure was adjusted upward by 4,700 AUM's to 92,964 AUM's to maintain consistency. Of the 5,214,848 acres in Alberta's three Forest Reserves, 943,410 acres were considered grazable and provided the AUM's as given.

Provincial Parks--Three grazing associations lease 43,400 acres in the Cypress Hills from the Parks Division. This area had a capacity of 16,300 AUM's of grazing in 1965.

Land Administered by Local Governments

This land contributed 3,839,300 acres to the provincial total of



## Federally Administered Grazing Land

### Department of Indian Affairs

Indian Reserves in Alberta extend over 1,633,714 acres with 1,117,900 of these being classified as: tame pasture (10,662), native grass (653,871), and wooded areas (453,211) in 1967. According to its ascribed capacity this land provided 405,797 AUM's of grazing potential. Of this acreage 77,539 acres were leased to non-band members. In the early spring of 1967 there were reported to be only 20,468 cattle on this land, indicating a gross underutilization of this natural resource. There is little reason to believe that the 1966 total was significantly different from this figure. This source of grazing was omitted from the remainder of the study.

### PFRA

The PFRA controls 12,960 acres of grazing land in Alberta, 2,360 acres of which are irrigated. This land produced an estimated 11,060 AUM's grazing in 1966. In the early 1960's the PFRA was responsible also for administration of grazing privileges on part of the approximately 700,000 acre British Block, but this area was not used in 1966 for grazing of domestic stock.

### Department of National Defense

Two grazing associations had grazing privileges on the Wainwright Military Camp in 1966 and used 9,938 AUM's of grazing. Applying a carrying capacity of 50 acres per head per year to this acreage, 41,400 acres out of the large area were used for domestic grazing.



Table 4

## AN INVENTORY OF PUBLIC GRAZING LAND IN ALBERTA

Grazing Region Administrative Agency	Provincial Totals	I	II	IV	V	VI	VII	VIII
(numbers are acres in thousands followed by AUM's in thousands)								
I Provincially Administered Grazing Lands								
A. Department of Lands and Forests								
1. Private leases and road allowances	3,666.5 1,038.9	1,677.6 430.6	404.2 104.0	508.3 212.6	173.2 65.9	259.1 90.8	247.2 56.0	396.9 79.0
2. Grazing Associations <sup>a</sup>	884.5 213.9	245.8 57.4	175.4 43.4	42.7 13.9	91.5 22.5	27.6 6.6	154.2 40.3	147.3 29.8
3. Grazing Reserves <sup>a</sup>	179.8 56.3	85.3 20.9	4.6 5.8	30.9 9.4		30.5 10.3	13.4 5.1	15.1 4.8
4. Grazing Permits <sup>a</sup>	555.7 142.9	107.7 26.6	56.5 14.1	19.3 7.5	41.8 12.8	54.8 18.9	141.3 35.8	134.3 27.2
5. Head Tax <sup>a</sup> Allotments	37.2 11.1						34.0 10.3	3.2 .8
6. Forest Reserve <sup>a</sup> Permits	943.4 84.5						943.4 84.5	

continued



Table 4 Continued

Grazing Region Administrative Agency	Provincial Totals	I	II	IV	V	VI	VII	VIII
(numbers are acres in thousands followed by AUM's in thousands)								
7. Provincial <sup>a</sup> Park Leases	43.4 16.3	43.4 16.3						
Sub Total	6,310.5 1,563.9	2,159.8 551.8	640.7 167.3	601.2 243.4	306.5 101.2	372.0 126.6	1,533.5 232.0	696.8 141.6
B. Department of Municipal Affairs and Irrigation Districts								
1. Special Areas								
(a) Grazing <sub>b</sub> Leases	3,026.7 789.4	3,026.7 789.4						
(b) Grazing <sub>b</sub> Permits	11.7 3.1	11.7 3.1						
(c) Grazing <sub>b</sub> Associations	175.6 49.3	175.6 49.3						
2. Counties, Municipal Districts, and Improve- ment Districts <sub>c</sub>								
	16.0 3.9	5.0 1.2	3.1 .3	.4 .2	1.5 .4	1.8 .4	6.0 1.4	
3. Irrigation <sub>d</sub> Districts								
	609.3 151.1		609.3 151.1					
Sub Total	3,839.3 996.8	3,219.0 843.0	610.6 151.4	.4 .2	1.5 .4	1.8 .4	6.0 1.4	



Table 4 Continued

Grazing Region	Provincial Totals	I	II	IV	V	VI	VII	VIII
Administrative Agency								
(numbers are acres in thousands followed by AUM's in thousands)								
II Federally Administered Grazing Lands								
A. Department of Indian Affairs								
1. Indian Reserves <sup>e</sup>	1,117.9			455.8	101.0	72.7	299.8	188.6
	405.8			212.1	25.6	19.3	108.9	39.9
B. PFRA								
1. Bow River Project <sup>f</sup>	13.0		13.0					
	11.1		11.1					
C. Department of National Defense								
1. Wainwright Military Camp	41.4					41.4		
	9.9					9.9		
Sub Total	1,172.3		13.0	455.8	101.0	114.1	299.8	188.6
	426.8		11.1	212.1	25.6	29.2	108.9	39.9
Total of Alberta Public Grazing Land	11,322.1	5,378.8	1,264.3	1,057.4	409.0	487.9	1,839.3	885.4
	2,987.5	1,394.8	329.8	455.7	127.2	156.2	342.3	181.5

continued



Table 4 Continued

- <sup>a</sup> Alberta Department of Lands and Forests, Files and Annual Reports (Edmonton: Dept. of Lands and Forests, 1966)
- <sup>b</sup> Alberta Department of Municipal Affairs Advisory Committee to the Special Areas, Minutes and Files (Edmonton: Dept. of Municipal Affairs, 1967)
- <sup>c</sup> Alberta Department of Municipal Affairs, Files and Mail Contact with county and municipality secretaries (Edmonton: Dept. of Municipal Affairs).
- <sup>d</sup> Correspondence with the secretaries of the 12 Alberta Irrigation Districts.
- <sup>e</sup> Alberta Department of Indian Affairs, Alberta Regional Reports (Edmonton: Dept. of Indian Affairs, 1967).
- <sup>f</sup> Letter, Mr. Gordon Bruins, Agricultural Operations and Land Administration, Bow River Project to author, July 18, 1967.



## Public Grazing Lands as a Part of Total Grazing Land

This study selected for analysis individuals who obtain grazing in the form of Department of Lands and Forests' grazing leases, grazing associations or grazing reserves, and also as Special Areas' grazing leases. This land represented 76.2 percent of the total publicly owned grazing acreage and 81.2 percent of the total AUM's supplied by all public sources excluding Indian Reserves (which were omitted from the remainder of the study). An appraisal of the utilization of this land necessitated the inclusion of an investigation of the grazing land supplied by the private sector of the economy which was used by individual operators in conjunction with public sources of grazing land. Users of the previously mentioned types of grazing land directly controlled and used for grazing purposes 12,920,700 acres of land (not including land used jointly in the form of a community pasture or grazing reserve), with 8,527,200 of this total being leased from public sources. Sixty point nine percent of this leased acreage was contained in Region I (Table 5).

Table 6 classifies this same acreage by pasture type. Approximately 85 percent of all regions consisted of unimproved native grass except Region V which had 70 percent. A further classification of types of grazing land by tenure was not readily available; however, there were indications that nearly all of the land leased from public sources was of an unimproved nature.

## Rental Rates for Public Grazing Land

Rentals on slightly over 81 percent of public grazing land were received on the basis of the following formula devised by the Department of Lands and Forests in 1960.



Table 5

## TOTAL PASTURE ACREAGE CLASSIFIED BY TENURE

Tenure	I	II	IV	V	VI	VII	VIII	Total
	(in thousands of acres)							
Privately owned	1,705.8	490.2	713.3	522.9	306.8	225.8	127.5	4,092.3
Rented	56.2	61.6	81.1	45.0	24.8	21.8	10.7	301.2
Leased (to individuals)	5,199.8	947.5	654.9	451.6	294.0	440.2	539.2	8,527.2
Total	6,961.8	1,499.3	1,449.3	1,019.5	625.6	687.8	677.4	12,920.7

Note: Minor differences between Table 5 and Table 6 are due to rounding.



Table 6

## PASTURE ACREAGE CLASSIFIED BY PASTURE TYPE

Type of Pasture	I	II	IV	V	VI	VII	VIII	Total
(in thousands)								
Unimproved native	6,042.9	1,273.7	1,146.5	788.9	441.9	561.4	569.6	10,924.9
Improved native	12.4	.1	12.4	13.7	13.6	.8		53.0
Permanent tame	177.0	53.0	32.4	40.8	32.2	24.3	23.9	383.6
Sub total	6,232.3	1,326.8	1,291.3	843.4	487.7	586.5	593.5	11,361.5
Crop rotation	64.4	.6	21.5	.6	18.9	8.7	12.3	127.0
Hay land	77.1	27.3	40.8	38.5	29.4	45.0	12.0	270.1
Aftermath stubble	577.7	144.7	96.4	13.5	98.5	47.4	59.7	1,037.9
Totals	6,951.5	1,499.4	1,450.0	896.0	634.5	687.6	677.5	12,796.5
AUM's supplied	1,780.9	544.9	654.5	293.3	223.8	215.1	109.5	3,822.0



$$\frac{250 \times \text{price} \times \text{grazing district royalty}}{\text{grazing capacity}}$$

where 250 is the estimated annual gain in pounds of beef; price is the average price of all grades of cattle except feeder calves sold on the Calgary market from July to December of the previous year; grazing district royalty is the share of the total forage value retained by the government as taxes and rental. This rental for District A is 20 percent, B is 16 2/3 percent, and C is 12 1/2 percent; grazing capacity constitutes the number of acres required to graze one mature beef animal on a twelve month basis.

This formula, using the average of cattle prices from 1960 to 1968, valued the rental per AUM as:

Grazing District A	- 84.80¢
B	- 70.66¢
C	- 52.99¢
Weighted Average	- 74.27¢

and implied that the total value of an AUM (i.e. value of the beef produced by an animal unit grazing one month on native grass) was \$4.24 even though charges were levied on a per acre basis.

Department of Lands and Forests' individual leases, road allowances leases, grazing permits, and the Department of Municipal Affairs' grazing leases and grazing permits were rented as outlined above. Grazing associations lease their land from the Department of Lands and Forests, the Department of Municipal Affairs, and the Provincial Parks Board under the same arrangement. The lease rental, amortization and depreciation of improvements (i.e. fencing, corrals, brush cutting etc.) and in some cases breeding fees and/or range rider wages were prorated among association members on a per AUM basis. The Department of Lands and Forests provided 56,300 AUM of grazing through its' ten grazing reserves situated throughout the province. Total charge per AUM of grazing (which included all facilities and



supervision) ranged from \$1.90 at Wanham to \$3.00 on the irrigated grazing reserves east of Lethbridge.

Unsupervised grazing was provided by the Department of Lands and Forests in the head tax allotment areas where the rental was:

Grazing District A - 75¢ per AUM  
B - 65¢ per AUM  
C - 45¢ per AUM

A similar type of grazing was available on forest reserves at an average charge of 73.2 cents per AUM. The Department of National Defense also rented parts of the Wainwright Military Camp to two grazing associations on a per head basis.

Counties, municipal districts, and improvement districts provided a relatively small amount of grazing, which was rented both on an acreage and AUM basis at what appeared to be negotiable rates. Similarly no fixed pattern was evident in irrigation districts' grazing rentals. The St. Mary and Milk River Development charged \$1.10 per AUM; the Lethbridge Northern District charged \$1.00 per acre; and the Eastern Irrigation District leased 177,611 acres to individuals and 426,036 acres to 11 grazing associations at an average charge of \$.246 per acre.

77,539 acres of Indian Reserve land was leased to 61 non-band members at privately negotiated rates. The Bow River Project leased 6,600 acres to 25 individual operators at a rate of \$1.00 per acre per year and also provided 4,000 acres of dryland grazing and 2,360 acres of irrigated pasture to two grazing associations who, in turn, charged \$2.15 per AUM for grazing.



## CHAPTER III

### THE IMPROVEMENT AND DEVELOPMENT OF PASTURELAND

An examination of various aspects of pastureland improvement and development was facilitated by the comparison of operations utilizing grazing leases to operations using community pasture. Improvements made in 1965, further profitable improvements, and factors effecting the improvement of both privately owned and public grazing land were investigated. Finally, responses to several grazing management questions were summarized.

#### Community Pasture and Grazing Leases

Presently in Alberta there are two methods available to utilize public grazing land, the grazing lease to individual firms and communal grazing. Approximately 79.2 percent of the total public AUM's are administered in the form of grazing leases and annual grazing permits.<sup>1</sup> Providing that the land is not abused, lessees are given nearly complete managerial freedom of the leased land. Operators are responsible for the upkeep of the lease; they can graze the land according to their own judgment and can make use of assistance programs for pasture improvement. Due to the long-term nature of most grazing leases this land is frequently

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<sup>1</sup> Government agencies that use this method are: Department of Lands and Forests; private grazing leases and grazing permits; head tax allotments and forest reserve allotments that are made to individuals; Department of Municipal Affairs; Special Areas grazing leases and grazing permits; county and municipal district grazing, irrigation district grazing (except for eleven grazing associations in the Eastern Irrigation District) and dryland areas throughout the Bow River Project.



treated as though it were deeded and often is considered as a nearly permanent part of the farm or ranch unit. In many instances lease rental payments are on the same order of cost per acre as taxes on similar deeded land.<sup>1</sup> These factors all contribute to an economic rent or supernormal profit that is frequently reflected into a consideration fee for the transferral of the lease.<sup>2</sup>

The remaining 20.8 percent of public grazing takes the form of communal grazing land (generally a four-to-six month period) on a collective basis. Part of this land is administered in the form of a long-term grazing lease or "permanent" annual grazing permit given to a grazing association. The costs incurred, i.e. lease rental, fencing, supervision, breeding, etc. were proportioned on an AUM basis to the members of the association. The remainder of communal summer grazing takes place on government operated grazing reserves where all supervision and upkeep are undertaken by the province and per AUM charges are levied to cover those costs. Cattle using these two forms of summer grazing are then grazed on privately owned land for the remainder of the season. Thus differences in the type of leasing arrangement effect the management and organization of the farm or ranch unit.

Table 7 illustrates the relatively similar pattern of the January 1 inventory of livestock types for communal graziers and

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<sup>1</sup> L.M. Forbes, "An Analysis of the Relationships Between Sale Values of Public Grazing Leases and Sale Values of Comparable Private Range Lands in Southern Alberta" (unpublished MSc. thesis, Utah State University, 1965), p. 47.

<sup>2</sup> Ibid., pp. 48-52.



leaseholders. Differences did exist within grazing regions, but provincial averages were quite similar. The pronounced difference in livestock sales per farm is given in Table 8. Community pasture users had lower cattle sales per farm in four of the seven grazing regions, but when the regions were weighted by their relative proportions of public grazing to provide a provincial average, the communal graziers were found to have somewhat higher average cattle sales. In all regions in which average cattle sales by leaseholders exceeded those of community pasture users, the average January 1 cattle numbers were of similar relative proportions. Thus regions in which leaseholders had higher average cattle sales corresponded with regions in which they had higher average cattle numbers. Together the two tables imply a higher level of annual sales per head of cattle (January 1, 1966 count) for annual graziers as opposed to leaseholders. This relationship can be interpreted to indicate that communal graziers received more dollars per head for their cattle (because of feeding to a higher weight) and that on the average lessees had on hand on January first a larger proportion of the year's output of cattle. Table 8 also indicates that very little income is derived from sheep or horses. Hogs, poultry, and dairy products provided more revenue for the average communal grazier than for a lessee in all regions and over twice as much revenue for the province as a whole.

Table 9 gives differences in farm size and use of land. In all regions lessees had larger average total acreages as well as larger acreages of hay, silage and greenfeed, pasture, and unused or idle land. Land acreage devoted to crop production (including summerfallow) was quite



Table 7

## AVERAGE LIVESTOCK NUMBERS PER FARM

Livestock Type	I	II	IV	V	VI	VII	VIII	Province
	(number of head)							
Cattle and Calves as of Jan.1, 1966	119 142	98 141	213 159	107 124	90 61	72 63	33 46	109 103
Sheep all ages as of Jan.1, 1966	3 14	5 4	8 4	0 4	1 1	0 2	0 1	3 6
Horses and Mules as of Jan.1, 1966	3 4	2 3	4 7	3 3	4 2	6 2	1 2	3 3
Hogs sold during 1965	18 5	58 0	42 15	7 17	43 13	54 20	29 16	40 11



Table 8

## TOTAL SALES OF LIVESTOCK PER FARM IN 1965

Livestock Type	I	II	IV	V	VI	VII	VIII	Province
	(dollars)							
Cattle	6,056	8,646	13,743	5,751	5,193	4,037	1,503	7,387
Community pasture	7,275	18,013	8,581	8,014	3,008	2,730	2,282	5,848
Lease								
Sheep	55	10	140	1	3	9	0	30
Community pasture	186	341	98	101	0	9	16	101
Lease								
Horses	30	4	37	34	82	223	0	31
Community pasture	33	16	38	37	27	16	4	24
Lease								
Hogs, poultry	1,260	1,846	1,237	409	2,093	2,753	1,091	1,538
and dairy products	391	29	558	537	1,934	1,402	642	713
Lease								



Table 9

## AVERAGE FARM ACREAGES BY LAND USE

Use	I	II	IV	V	VI	VII	VIII	Province
	(acres)							
Hay, silage and greenfeed	76 183	57 104	115 176	65 184	108 109	99 99	64 75	78 138
Grain and seed	368 346	220 390	238 103	370 323	235 92	108 138	507 260	280 246
Summerfallow	313 274	132 319	133 74	298 191	75 46	52 65	90 87	164 160
Pasture	1,313 3,213	611 4,423	845 2,076	426 1,490	270 833	118 725	57 777	632 1,937
Unused or idle	4 82	12 114	5 54	25 15	54 56	78 154	209 182	32 95
Total	2,074 4,098	1,032 5,356	1,336 2,483	1,184 2,203	742 1,136	455 1,181	927 1,381	1,186 2,576



similar for both types of public land users. The major area of difference is in pasture acreage. Lessees had from two and one-half to 13 1/2 times as much pasture acreage depending on the region and slightly over three times as much acreage on a provincial basis. A further analysis of pasture acreage by pasture type is given in Table 10. The pasture acreages of Table 9 were those used solely for grazing whereas Table 10 included aftermath and residue grazing acreage as well as permanent pasture in the total pasture acreage. Improved native pasture, permanent tame pasture, crop rotations (which included cover crops), and hayland contributed a relatively small amount to total pasture acreage. For nearly all regions and for the provincial average, lessees had greater acreages of both hayland and permanent pasture, but this acreage was a smaller proportion of total pasture acreages than was that of the communal grazier. Although discrepancies occurred within regions, the provincial averages of aftermath stubble grazing acreages were very similar. The major difference between the two types of public land users was due to native pasture acreage, with lessees having substantially larger amounts of this type of pasture in all regions than community pasture patrons. Leaseholders had a larger number of AUM's attributable to pastureland for all regions than did their counterparts. More importantly though in all regions excepting Region VII, the pastureland of communal graziers was considerably more productive than the lessees' pasture mainly because of the lower proportion of native grass in the pasture acreage.

Differences in ownership are given in Table II. Communal



Table 10

AVERAGE PASTURE ACREAGES BY PASTURE, TYPE, TOTAL AUM'S PRODUCED  
AND AUM'S PER ACRE OF PASTURELAND

Type of Pasture		I	II	IV	V	VI	VII	VIII	Province
Native	Community pasture Lease	1,182	562	758	400	221	118	36	570
		3,116	4,303	2,014	1,392	777	693	749	1,869
Improved native	Community pasture Lease	13	0	46	0	1	0	0	7
		4	0	0	3	29	1	0	7
Permanent tame	Community pasture Lease	47	37	42	26	48	0	20	39
		89	119	41	70	26	30	28	57
Crop rotation	Community pasture Lease	0	0	47	3	0	0	2	6
		36	3	18	0	42	11	16	22
Hayland	Community pasture Lease	20	13	64	21	35	65	5	24
		39	89	46	67	33	54	15	41
Aftermath stubble	Community pasture Lease	184	122	219	187	169	92	7	150
		283	241	73	188	58	57	78	159
Total	Community pasture Lease	1,446	734	1,176	637	474	275	70	796
		3,567	4,755	2,192	1,720	965	846	886	2,155
Net AUM's from total pasture	Community pasture Lease	562.2	403.8	787.1	215.1	235.6	72.3	38.1	396.0
		868.0	1,143.8	856.7	575.2	270.3	271.2	138.4	570.1
AUM's per acre of pasture	Community pasture Lease	.389	.550	.669	.338	.505	.263	.544	.497
		.243	.241	.391	.334	.280	.321	.156	.265



Table 11

## AVERAGE PASTURE ACREAGE BY TENURE

Tenure	I	II	IV	V	VI	VII	VIII	Province
Owned	846 773	357 1,055	877 924	471 834	382 319	220 275	55 159	491 571
Rented	18 28	63 58	155 76	66 61	52 5	38 26	16 11	61 31
Leased	629 2,762	314 3,643	99 1,213	98 830	19 641	18 545	0 716	244 1,553
Total	1,493 3,563	734 4,756	1,131 2,213	635 1,725	453 965	276 846	71 886	796 2,155

Note: Minor differences between average total pasture acreage given in this table and those in Table 10 are due to rounding of expansion factors



graziers own a far greater proportion of their pasture acreage than their counterparts, the proportion ranging from a low of 49 percent in Region I and 57 percent in Region II to from 74 to 84 percent in the remaining regions. Lessees, on the other hand, owned as low as 18 percent of their pastureland (Region I) to a high of 48 percent in Region IV, while the provincial average was 26.5 percent.

#### Developing and Improving Pastureland

Operators were queried on whether they planned to expand their livestock operation in the immediate future. Table 12 gives the tabulation of responses to this question. On a provincial basis approximately 29 percent of the public land users planned on expanding grazing operations within the next three years. A greater proportion of operators in Region II appeared to be planning on expansion than in other regions. There was also a small portion of operators in nearly all regions who planned either to expand feedlot operations or hold more young cattle over the winter. A clear majority of operators did not plan to expand livestock operations. Reasons for not planning to expand these operations are summarized in Table 13. The principal reason for non-expansion was the lack of additional grazing land for both types of public land users.

Nearly all of Alberta's native grazing land is being utilized at present. Hence increases in pasture output will have to be the result of raising the productivity of current pastureland (through better management in order to utilize current grazing resources more effectively and by the replacement of native species of forage with more productive ones) or diverting cropland into the production of livestock feeds-- either in the direct form of pastureland or a hay or feedgrain production.



Table 12

TYPE OF LIVESTOCK OPERATION OPERATORS EXPECTED  
TO EXPAND WITHIN THE NEXT THREE YEARS

Type of Operation	I	II	IV	V	VI	VII	VIII	Province
	(percent)							
Grazing operations	28.4 27.2	44.8 34.2	24.7 27.4	22.4 38.5	12.7 44.0	5.7 22.4	10.0 29.4	29.2 29.6
Community pasture Lease								
Feed lot operations	15.2 3.9	4.3 -	22.5 5.7	6.9 3.0	14.2 -	- 6.5	20.0 9.1	11.2 4.7
Community pasture Lease								
Holding calves and yearlings over winter	11.3 8.1	6.9 .6	16.5 8.7	3.1 1.4	19.2 6.8	83.4 24.3	- 16.6	10.8 10.9
Community pasture Lease								
Change from sheep to cattle	- -	- -	- .3	- -	- -	- -	- 1.8	- .3
Community pasture Lease								
Other	3.7 2.5	5.1 1.1	.9 14.1	- -	3.5 3.4	- -	- 1.8	3.3 2.9
Community pasture Lease								
None	30.2 54.3	34.6 63.0	34.5 43.8	58.0 53.9	46.9 42.4	- 41.2	60.0 41.3	39.6 48.6
Community pasture Lease								
No response	11.2 4.0	4.3 1.1	.9 -	9.6 3.2	3.5 3.4	10.9 5.6	10.0 -	5.9 3.0
Community pasture Lease								



Table 13

REASONS GIVEN FOR NOT PLANNING TO EXPAND LIVESTOCK  
OPERATION WITHIN THE NEXT THREE YEARS

Reason	I	II	IV	V	VI	VII	VIII	Province
	(percent)							
Satisfied with present size of operation	14.8 13.6	10.9 32.4	9.9 11.7	27.0 4.3	3.5 6.6	5.7 3.7	7.7 17.1	11.3 11.7
Additional grazing land not available	20.3 28.9	16.0 18.3	15.2 28.4	33.1 26.7	20.6 9.5	- 3.7	- 7.2	17.8 19.6
Shortage of necessary capital	- .8	3.3 -	5.0 5.4	- -	- 6.3	- 3.7	7.7 1.8	2.3 2.2
Low return on investment	3.7 1.9	1.7 -	5.0 2.7	6.0 4.3	20.6 6.3	- 11.0	30.9 3.6	8.6 4.1
Shortage of labour	5.6 7.7	3.4 .6	5.8 2.7	.4 15.7	8.4 7.9	- 9.2	23.0 3.6	6.2 7.3
Others	1.9 7.3	6.7 14.7	.8 2.7	- 10.2	3.1 19.0	5.7 11.0	7.7 9.0	4.0 9.2
No response	53.7 39.8	58.0 34.0	58.3 46.4	33.5 38.8	43.8 44.4	88.6 57.7	23.0 57.7	49.8 45.9



Table 14 gives acreages that operators considered to be profitable methods of improving their own deeded pastureland. Operators felt that 1,448,100 acres could be profitably improved with 591,500 acres of these improvements being of the kind that physically improve the productivity of the pastureland (i.e. reseeding to tame grass and/or legume, clearing brush and trees and reseeding, construction of diversion terraces, drainage of swampy areas, and reseeding of cultivated land). The remainder of the improvements were primarily management techniques that would augment the utilization of the existing pastureland. Region I contained the largest acreage of owned pastureland and also the largest acreage of profitable improvements.

In a similar fashion Table 15 gives the acreage of profitable pasture improvements that could be made on leased pastureland. Region I contained the largest amount of leased pastureland and also had the greatest potential for improvement. A total of 1,847,900 acres were designated as being profitable to undergo physical improvements. Excepting Region II the profitable improvements of reseeding to tame grass and/or legume and clear brush and trees and reseed were a larger proportion of total pasture acreage for leased land than for deeded land.

Acreages of pasture improvements carried out in 1965 on owned and leased land are given in Tables 16 and 17. A larger proportion of owned land was physically improved (broken and reseeded or else cleared, broken and reseeded) than of leased pastureland even though as previously mentioned, proportionately more of the leased land was considered to be profitable to further develop. Development of water facilities was carried out to a larger extent on leased land than on



Table 14

## PROFITABLE PASTURE IMPROVEMENT PRACTICES ON OWNED LAND

Pasture Improvement Practice	I	II	IV	V	VI	VII	VIII	Province
	(thousands of acres)							
Reseed to tame grass and/or legume	138.4	58.3	54.6	39.4	20.7	9.5	4.0	324.9
Clear brush and trees and reseed	7.9	.8	34.2	27.1	48.5	42.1	36.7	197.3
Fence to control special vegetation	14.1	-	9.4	-	-	.3	-	23.8
Rotational grazing	37.7	12.4	18.2	.7	13.4	.3	4.8	87.5
Distribute grazing with salting locations	30.4	-	4.4	-	-	-	-	34.8
Development of additional water facilities	124.9	43.2	12.0	-	.3	-	12.5	192.9
Construction of diversion terraces	14.9	5.9	-	2.2	.4	-	-	23.4
Drainage of swampy areas	.2	-	.6	-	2.2	2.2	3.7	8.9
Fertilizer application	21.1	46.3	38.2	8.5	24.0	12.6	10.9	161.6
Control weeds and poisonous plants	20.2	2.0	40.4	4.4	9.7	6.3	-	83.0
Bush control	3.3	2.5	35.9	18.5	8.2	6.0	-	74.4
Fencing to utilize pasture and forage crop combinations	30.1	-	-	-	-	-	2.8	32.9
Feeding concentrates to grazing animals	180.5	-	5.2	-	-	-	-	185.7
Reseed cultivated land	21.9	6.4	4.3	-	-	1.7	2.7	37.0
Total owned pastureland	1,705.8	490.2	713.3	522.9	306.8	225.8	127.5	4,092.3



Table 15

## PROFITABLE PASTURE IMPROVEMENTS ON GRAZING LEASES

Pasture Improvement Practices	I	II	IV	V	VI	VII	VIII	Province
	(thousands of acres)							
Reseed to tame grass and/or legume	738.6	85.1	26.8	84.8	31.8	15.3	14.6	997.0
Clear brush and trees and reseed	23.7	.8	132.5	44.9	64.8	162.1	243.2	672.0
Fence to control special vegetation	.2	-	28.6	-	-	15.8	12.7	57.3
Rotation grazing	90.5	30.9	14.5	312.1	84.1	13.0	61.0	606.1
Distribute grazing with salting locations	13.4	10.8	73.5	-	-	-	34.5	132.2
Development of additional water facilities	503.7	320.2	36.3	142.8	8.9	13.3	104.8	1,130.0
Construction of diversion terraces	26.4	23.2	-	37.4	.1	-	-	87.1
Drainage of swampy areas	4.3	.7	.9	10.2	5.9	33.4	31.8	87.2
Fertilizer application	30.5	13.9	64.6	17.6	89.4	-	5.7	221.7
Control weeds and poisonous plants	23.8	13.8	117.8	9.8	-	15.1	15.9	196.2
Brush control	91.3	-	53.0	61.2	56.4	66.5	29.3	357.7
Fencing to utilize pasture and forage crop combinations	15.2	7.0	-	-	-	-	31.1	53.3
Feeding concentrates to grazing animals	159.5	6.3	-	-	-	-	-	165.8
Reseed cultivated land	1.1	-	-	-	-	-	3.5	4.6
Total leased pastureland	5,199.8	947.5	654.9	451.6	294.0	440.2	539.2	8,527.2



Table 16

## PASTURE IMPROVEMENT PRACTICES CARRIED OUT ON OWNED PASTURE LAND IN 1965

Pasture Improvement Practice	I	II	IV	V	VI	VII	VIII	Province
	(thousands of acres)							
Reseed to tame grass and/or legume	12.3	5.0	3.0	.6	4.2	.9	1.2	27.2
Clear brush and trees and reseed	.7	-	1.9	.5	4.4	.1	.8	8.4
Fence to control special vegetation	13.8	.6	2.4	-	-	-	2.6	19.4
Rotational grazing	36.7	172.5	11.2	-	4.3	2.0	6.3	233.0
Distribute grazing with salting locations	173.7	-	15.5	-	-	-	-	189.2
Development of additional water facilities	25.3	-	-	.7	-	-	2.2	28.2
Construction of diversion terraces	1.4	2.6	-	-	-	-	-	4.0
Drainage of swampy areas	.3	-	-	-	-	-	-	.3
Fertilizer application	.8	11.0	4.7	.7	12.4	5.9	3.3	38.8
Control weeds and poisonous plants	15.7	1.0	2.4	-	-	-	.2	19.3
Brush control	2.7	-	.8	1.9	1.3	.3	2.8	9.8
Fencing to utilize pasture and forage crop combinations	14.1	-	-	-	-	-	-	14.1
Feeding concentrates to grazing animals	.3	-	-	-	4.5	-	-	4.8
Reseed cultivated land	.7	1.2	.4	-	.5	-	1.9	4.7
Total owned pastureland	1,705.8	490.2	713.3	522.9	306.8	225.8	127.5	4,092.3



Table 17

## PASTURE IMPROVEMENT PRACTICES CARRIED OUT ON GRAZING LEASES IN 1965

Improvement Practice	I	II	IV	V	VI	VII	VIII	Province
	(thousands of acres)							
Reseed to tame grass and/or legume	18.0	3.3	-	2.2	-	.2	1.1	24.8
Clear brush and trees and reseed	.4	-	-	1.8	15.7	.9	12.7	31.5
Fence to control special vegetation	-	-	5.1	-	-	3.6	15.4	24.1
Rotational grazing	83.9	28.7	.8	-	-	14.1	18.3	145.8
Distribute grazing with salting locations	9.2	10.8	73.5	-	-	-	-	93.5
Development of additional water facilities	11.4	4.9	2.9	81.3	-	.2	11.0	111.8
Construction of diversion terraces	-	-	-	-	-	-	-	-
Drainage of swampy areas	-	-	-	-	-	.8	-	.8
Fertilizer application	-	2.9	-	-	-	-	-	2.9
Control weeds and poisonous plants	1.0	-	2.7	-	.6	-	-	4.3
Brush control	-	-	-	-	.3	1.2	-	1.5
Fencing to utilize pasture and forage crop combinations	7.1	-	-	-	-	-	-	7.1
Feeding concentrates to grazing animals	4.4	-	-	-	-	-	-	4.4
Reseed cultivated land	-	-	-	-	-	-	-	-
Total leased pastureland	5,199.8	947.5	654.9	451.6	294.0	440.2	539.2	8,527.2



owned land, probably because water resources on deeded land had already been developed.

#### Factors Affecting Improvement of the Public Pasturelands

Reasons for failing to improve owned pastureland in 1965 are given in Table 18. Lack of time, more profitable use of capital elsewhere in the business, all grazing land was fully developed, were the major reasons given by both types of public grazing land users. Operators felt quite well informed about costs, benefits, and risk of pasture improvement and did not consider financing the improvement program to be a serious drawback. Table 19 gives reasons for failing to improve public grazing land in 1965. Since the decision to make pasture improvement was not within the jurisdiction of an individual communal grazer, the question was not really applicable to him. Lessees, on the other hand, gave lack of time and more profitable use of capital elsewhere in the business as their major reasons for not making improvements. The high percentage of non-respondents in these two tables was due to the fact that the operators who had made improvements were included in this category.

Table 20 gives a summary of lessees by the acreage of their leases as well as an analysis of the amount of expenditure made by each of the lease categories. With the exception of the third category the amount of money spent on the specified physical improvements of public land increased directly as the size of the lease increased. Conversely, this table points out that the amount of money spent per acre on pasture improvements decreases as the size of the lease increases.



Table 18

REASONS GIVEN FOR FAILING TO IMPROVE OWNED PASTURE LAND DURING 1965

Reason	I	II	IV	V	VI	VII	VIII	Province
	(percent)							
Lack of information on costs and benefits	-	-	14.9	.5	-	-	-	1.8
	2.5	13.6	-	5.5	-	-	-	2.0
More profitable use of capital elsewhere in the business	13.6	10.8	-	19.2	22.6	-	20.0	13.4
	10.3	7.4	16.1	20.7	19.6	22.0	5.4	13.5
Lack of time	10.0	18.4	20.2	9.6	7.2	-	-	13.0
	11.0	21.0	13.4	20.7	3.3	3.7	3.6	9.7
All grazing land owned was fully developed in prior years	17.0	14.2	15.3	9.6	5.0	-	20.0	13.0
	8.8	10.4	9.6	1.3	.2	3.7	12.6	7.3
Too risky	3.4	-	-	-	-	-	-	.6
	3.7	-	.2	-	-	-	1.8	1.7
Cannot borrow needed money to do the work	3.4	-	-	-	-	-	-	.6
	-	-	5.4	-	9.8	3.7	1.8	2.2
Other	20.3	12.5	17.3	15.8	13.8	89.1	30.0	16.7
	34.3	10.9	19.2	39.2	26.3	41.2	36.8	33.1
No response	32.3	44.1	32.3	45.3	51.4	10.9	30.0	40.9
	29.4	36.7	36.1	12.6	40.8	25.7	38.0	30.5



Table 19

## REASONS GIVEN FOR FAILURE TO IMPROVE THE CROWN GRAZING LANDS USED IN 1965

Reason	I	II	IV	V	VI	VII	VIII	Province
	(percent)							
As a patron of a grazing association or forest reserve, this improvement was not within my jurisdiction	37.9 .3	73.5 -	50.4 -	64.6 4.3	79.9 1.6	88.6 -	81.8 .8	65.8 .7
Lack of time	1.8 17.8	1.0 18.5	- 19.6	3.1 20.1	1.7 6.5	- 3.6	- 17.0	1.3 15.2
Too risky	- 4.9	- 6.2	- -	- 1.4	- 3.3	- 5.4	- 9.3	- 4.8
Could not borrow needed money to do the work	- .7	- -	- 2.5	- -	- 3.3	- 3.6	- 3.1	- 1.8
More profitable use of capital elsewhere in the business	3.6 10.4	.9 12.7	1.9 18.0	.5 23.0	- 22.9	- 27.0	9.1 18.5	1.8 17.1
Lack of information on costs and benefits	- 1.1	1.7 -	- 2.5	- 2.9	- -	- 3.6	- 1.5	.6 1.7
Other	29.5 47.6	5.9 53.1	13.8 44.2	12.6 39.7	1.7 52.6	5.7 36.1	- 29.5	10.3 42.5
No response	27.2 17.2	17.0 9.5	33.9 13.2	19.2 8.6	16.7 9.8	5.7 20.7	9.1 20.3	20.2 16.2



Table 20

AMOUNT SPENT FROM 1961 TO 1965 FOR PASTURE IMPROVEMENTS ON PUBLIC  
GRAZING LAND BY ACREAGE OF LEASED GRAZING LAND USED

Amount of Expenditures	Size of Lease in Acres			
	0-159	160-479	480-1,000	1,000-3,000 Greater Than 3,000
(dollars)	(percent)			
0	93.1	89.6	93.3	89.2
1-200	3.4	6.8	4.9	1.2
201-400	0.9	1.8	0.2	3.2
401-600	0.0	0.9	0.1	0.8
601-800	1.7	0.9	1.5	0.8
801-1,000	-	-	-	0.8
1,001-1,200	-	-	-	-
1,201 and over	0.9	-	-	1.1
total	100.0	100.0	100.0	100.0
Size group as percent of total	22.4	21.6	19.6	24.3
				12.1



Table 21 was constructed to investigate the hypothesis that an operator making an above average amount of improvements on deeded land would improve a greater than average acreage of his leased land. It was found that operators making any improvements on deeded land made a substantially lower levels of improvement on leased land.

There was general agreement by the users of public land that the grazing capacity of these lands should be increased (Table 22). Operators were not in agreement, however, on the method by which these improvements should be brought about. Community pasture patrons favored the alternative of the provincial government undertaking the improvements on a contract basis and then increasing the grazing capacity and grazing charges to cover costs. Lessees were nearly equally divided on the five alternatives that represented a continuum of levels of government participation. The amount of participation ranged from the individual incurring all costs and being granted incentives and concessions to the provincial government contracting the improvements and then increasing rentals to cover costs.

Operators were asked whether or not they favored including required improvement practices as part of the contract when renewing a public grazing lease. Table 24 shows that community pasture patrons were in favor of this arrangement, whereas, lessees were nearly equally divided on the desirability of this method. However, both types of public land users favored by a considerable margin the idea that improvements should be supervised by government officials if the improvement of the public grazing lands is left to the initiative of the individuals using the land (Table 25). The response to the question "If improvement of the public grazing land is left to the initiative of the individuals



TABLE 21

ACREAGE OF LAND IMPROVED IN 1961 to 1965 BY PRACTICES:  
RESEED TO TAME GRASS AND/OR LEGUME, CLEAR BUSH AND RESEED, DRAIN SWAMPY AREAS,  
CONSTRUCT DIVERSION TERRACES, AND CONTROL WEEDS AND POISONOUS PLANTS

	Privately Owned Land			
	No Acres Improved	One to Median Acres Improved	Greater than Median	
	(percent)			
Leased	No acres improved	60.86	16.55	11.18
	One to median acres improved	4.70	1.28	.73
	Greater than median acres improved	2.72	.60	1.38
Land				



Table 22

RESPONSE TO STATEMENT THAT GRAZING CAPACITY OF THE PUBLIC LAND SHOULD BE INCREASED

Response	Community Pasture	Lease
	(percent)	
Strongly agree	10.9	10.3
Agree	68.2	62.0
Disagree	10.2	16.5
Strongly disagree	.6	1.2
Don't know	10.1	10.0
	<hr/>	<hr/>
	100.0	100.0



Table 23

RESPONSE TO QUESTION: HOW WOULD YOU LIKE TO SEE IMPROVEMENTS MADE?

Method	I	II	IV	V	VI	VII	VIII	Province
	(percent)							
1. Community pasture Lease	23.0 9.9	26.7 7.3	35.4 26.9	45.3 32.6	46.4 42.3	22.2 22.4	30.0 21.9	32.6 20.1
2. Community pasture Lease	25.0 23.9	23.2 50.2	16.4 21.1	16.0 13.8	9.2 17.2	77.8 25.2	10.0 11.0	19.1 21.3
3. Community pasture Lease	17.4 6.5	5.2 11.7	6.0 14.4	6.4 34.0	15.7 13.6	- 20.6	30.0 32.1	10.8 16.7
4. Community pasture Lease	19.3 13.3	19.9 23.5	31.2 12.1	6.3 13.3	18.2 13.6	- 20.6	20.0 31.4	19.3 17.4
5. Community pasture Lease	7.6 40.9	19.9 7.3	5.5 22.7	16.4 3.1	- 9.9	- 7.5	- 3.6	10.9 21.0
No response	7.7 5.5	5.1 -	5.5 2.8	9.6 3.2	10.5 3.4	- 3.7	10.0 -	7.3 3.5

Improvement of the grazing capacity of public lands require at least three factors: (a) Money, (b) equipment and labour to carry out the improvements, and (c) a waiting or development period before the work done actually increases grazing capacity.

Alternates in making the improvements are:

1. The provincial government do the work by contract and increase grazing capacity and grazing charge at the end of a development period to cover costs.
2. The individual make all investment and do all work and in return be granted incentives or concessions to cover his costs such as decreased charges, extended leases, freedom from leases being cut due to improved grazing capacity, with some specified amount of improvement of Lands and Forests contributing 25 per cent of development costs to the individual doing the work in return for specified concessions.
3. A continuation of the recently announced policy of the Department of Lands and Forests contributing 25 per cent of development costs to the individual doing the work in return for specified concessions.
4. Continue present government policy for range improvement but with larger cash contributions. The individual to do the improvement work in return for lease concessions with some specified amount of improvement mandatory within each four year period.
5. Continue present policy unchanged with no mandatory improvements and few concessions.



Table 24

RESPONSE TO QUESTION: DO YOU FAVOR INCLUDING REQUIRED IMPROVEMENT PRACTICES WHEN RENEWING A PUBLIC GRAZING LEASE?

Response	Community Pasture	Lease
	(percent)	
No	29.2	47.8
Yes	62.8	48.3
No response	8.0	3.9
	<hr/>	<hr/>
	100.0	100.0



Table 25

RESPONSE TO QUESTION: IF IMPROVEMENT OF THE PUBLIC GRAZING LANDS  
IS LEFT TO THE INITIATIVE OF THE INDIVIDUALS  
USING THE LANDS, SHOULD THE IMPROVEMENT PRO-  
GRAM BE SUPERVISED BY GOVERNMENT OFFICIALS?

Response	I	II	IV	V	VI	VII	VIII	Province
	(percent)							
No	21.0 33.1	23.4 30.4	14.7 24.3	22.4 31.3	19.2 33.8	5.7 41.1	20.0 21.9	20.8 31.5
Yes	75.2 65.0	76.6 65.2	85.3 75.7	74.5 68.7	73.6 62.8	94.3 60.0	60.0 72.6	75.7 66.2
No Response	3.8 1.9	- 4.4	- -	3.1 -	7.2 3.4	- 1.9	20.0 5.5	3.5 2.3



using the lands, should some specified amount of range improvement be mandatory wholly at the individual user's expense because of the lower charges per AUM of grazing on public compared to private land?" was clearly negative for leaseholders of all regions but was nearly equally divided on a provincial basis between negative and affirmative for community pasture patrons. (Table 26). Reasons for disagreeing with the previous statement are given in Table 27. This open-end question was reduced to six categories for analysis. The most common reason given by all users of public land for disagreeing with the statement was that the investment on improvements on leased land would be too risky because of the insecurity of tenure of grazing leases and the high cost of making the required improvements. Opposition to the compulsory aspect of improvement was the second most important reason for disagreement. Again, the high percentage of non-respondents was due to the inclusion in this category of those individuals in favor of the statement.

#### General Management of the Public Grazing Lands

Going beyond the realm of pasture improvement and into general management, operators were asked if they thought the present (1966) methods of managing the public grazing lands should be changed. Response to this question is given in Table 28. Provincially, slightly more public land users were satisfied with present methods of management than were dissatisfied with them. Community pasture patrons were dissatisfied with their type of grazing arrangement and to a lesser extent, the management of grazing leases. Lessees expressed a desire for change in management of their grazing leases. The kinds of changes



Table 26

RESPONSE TO QUESTION: IF IMPROVEMENT OF THE PUBLIC GRAZING LANDS IS LEFT TO THE INITIATIVE OF THE INDIVIDUALS USING THE LANDS, SHOULD SOME SPECIFIED AMOUNT OF RANGE IMPROVEMENT BE MANDATORY WHOLLY AT THE INDIVIDUAL USER'S EXPENSE BECAUSE OF THE LOWER CHARGES PER ANIMAL UNIT OF GRAZING ON PUBLIC LANDS COMPARED TO PRIVATE LANDS?

Response	I	II	IV	V	VI	VII	VIII	Province
	(percent)							
No	30.9 65.1	41.6 62.7	54.6 57.7	68.0 64.3	44.1 79.7	94.3 68.3	60.0 54.0	46.0 64.1
Yes	57.5 26.5	49.8 37.3	39.4 42.3	22.4 29.8	26.2 16.9	5.8 22.4	20.0 44.0	40.6 30.1
No Response	11.6 8.4	8.6 -	6.0 -	9.6 5.9	29.7 3.4	- 9.3	20.0 2.0	13.4 5.8



Table 27

RESPONSE TO QUESTION: WHY DO YOU DISAGREE WITH THE STATEMENT THAT IF IMPROVEMENT OF THE PUBLIC GRAZING LAND IS LEFT TO THE INITIATIVE OF THE INDIVIDUALS USING THE LANDS, SHOULD SOME SPECIFIED AMOUNT OF RANGE IMPROVEMENT BE MANDATORY WHOLLY AT THE INDIVIDUAL USER'S EXPENSE BECAUSE OF THE LOWER CHARGES PER AUM OF GRAZING ON PUBLIC LANDS COMPARED TO PRIVATE LANDS?

Reason <sup>a</sup>	I	II	IV	V	VI	VII	VIII	Province
	(percent)							
1. Compulsory	3.9	17.2	22.9	15.9	5.7	-	20.0	12.9
Community pasture Lease	19.9	.6	17.0	10.4	6.8	10.2	12.8	14.4
2. Uneconomical	3.8	1.8	5.5	6.4	12.2	-	-	4.8
Community pasture Lease	10.7	7.3	8.5	16.5	6.8	15.0	1.8	9.9
3. Too risky	9.8	20.0	15.7	3.1	8.0	83.4	40.0	15.7
Community pasture Lease	7.0	19.1	14.7	10.3	37.2	31.8	25.6	17.6
4. Government land	3.8	-	5.5	29.7	11.2	-	-	6.2
Community pasture Lease	6.7	14.6	2.8	23.9	25.3	7.5	5.5	9.7
5. Rental too high	7.7	5.1	5.5	12.7	3.5	10.9	-	5.8
Community pasture Lease	14.1	1.1	5.9	3.1	-	3.7	3.6	7.4
6. Miscellaneous	-	-	-	-	3.5	-	20.0	1.3
Community pasture Lease	2.9	7.9	2.8	-	.2	1.9	1.0	2.1
No Response	71.0	55.9	44.9	32.2	55.9	5.7	40.0	53.3
Community pasture Lease	38.7	49.4	48.3	35.8	23.7	29.9	49.7	38.9

continued



Table 27 (continued)

a This open-end question was reduced to six categories:

1. The compulsory aspect of improvement is not desirable.
2. It is not economically feasible to develop the land further.
3. The investment in improvements would be too risky because of insecurity of tenure of a grazing lease and the high cost of improvements.
4. Since the land belongs to the government the individual should not have to pay for all improvements.
5. Lease rentals are too high to allow investments in improvements to be profitable.
6. Miscellaneous



Table 28

RESPONSE TO QUESTION: DO YOU THINK THE PRESENT METHODS OF MANAGING  
PUBLIC GRAZING LANDS SHOULD BE CHANGED?

Response	I	II	IV	V	VI	VII	VIII	Province
	(percent)							
No	46.2	54.3	52.7	48.4	53.5	5.7	60.0	52.0
	52.7	41.0	40.2	81.7	64.5	51.4	51.2	54.3
Yes	49.9	44.0	47.3	51.6	43.0	88.6	40.0	46.0
	46.0	59.0	59.5	18.3	22.0	48.6	48.8	44.1
No response	3.9	1.7	-	-	3.5	5.7	-	2.0
	1.3	-	.3	-	13.5	-	-	1.6



Table 29

RESPONSE TO QUESTION: WHAT TYPE OF PUBLIC GRAZING SHOULD BE CHANGED?

Type	I	II	IV	V	VI	VII	VIII	Province
	(percent)							
Provincial lease	34.6 17.9	11.5 51.1	19.0 43.8	3.6 13.3	6.4 20.9	46.9 48.6	- 46.8	14.3 30.3
Community pasture Lease								
Special Areas lease	- 23.5	- 1.1	- .2	- 2.9	- -	- -	- -	- 9.4
Community pasture Lease								
Grazing permit in forest reserve	3.6 -	1.6 -	12.2 5.5	- -	8.1 6.4	- -	- 1.8	4.1 1.4
Community pasture Lease								
Grazing associations	21.8 7.4	34.5 7.8	17.1 2.6	48.2 4.6	28.8 4.8	46.9 -	40.0 .2	31.2 4.3
Community pasture Lease								
No response	40.0 51.2	52.4 40.0	51.7 47.9	48.2 79.2	56.7 67.9	6.2 51.4	60.0 51.2	50.4 54.6



that operators felt were necessary in the management of public grazing are given in Table 30. This open-ended question was reduced to five categories to simplify explanation. Communal graziers displayed support for all categories of changes but gave slightly more emphasis on making annual adjustments in the carrying capacity ratings in order to eliminate grass being wasted or overgrazed. The fact that 47 percent of the variation in yields of shortgrass prairie forage is associated with May precipitation<sup>1</sup> could be utilized in developing limited annual regional adjustments in carrying capacities which in turn could enable the utilization of a greater proportion of forage than at present. The resulting variations in AUM's grazed on public land would require inter-year adjustments in the reserve pasturage that is supplied by private lands. Changes in management that would increase the security of tenure of grazing leases was sought by leaseholders. Public leaseholders wanted more protection for their equity in improvements made on their leases and also displayed dissatisfaction with the implications of the upper limits on public grazing available to any individual. If range improvements cause the leased land to produce more than the upper limit (4,800 AUM's in the Special Areas or 7,200 AUM's on a Department of Lands and Forests' grazing lease) of AUM's, the operator can be forced to relinquish part of his lease. A very diversified group of suggestions was included in the rather large miscellaneous category. Further breakdown of this group was impractical because of the very localized nature of many of the proposals.

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<sup>1</sup> S. Smoliak, "Influence of Climatic Conditions on Forage Production of Shortgrass Rangeland." Journal of Range Management, IX (1956), 89.



Table 30

## CHANGES IN THE MANAGEMENT OF PUBLIC GRAZING LANDS SUGGESTED BY OPERATORS

Type of Change <sup>a</sup>	I	II	IV	V	VI	VII	VIII	Province
	(percent)							
1. Security of tenure	7.3	2.9	6.4	6.1	7.6	83.5	13.3	6.6
Community pasture Lease	10.9	16.7	18.8	5.6	10.0	27.4	24.1	15.6
2. Rental rates	2.9	10.3	-	-	3.3	5.7	-	4.7
Community pasture Lease	4.6	11.1	1.4	-	2.9	3.2	3.6	3.5
3. Carrying capacities	2.9	11.8	-	17.0	13.2	-	-	9.0
Community pasture Lease	5.2	7.5	7.0	2.7	-	1.6	1.4	3.6
4. Management freedom	1.6	2.9	.2	5.6	4.1	-	6.7	3.2
Community pasture Lease	6.0	1.0	9.0	-	2.8	6.5	7.0	5.6
5. Miscellaneous	33.3	14.2	16.5	19.8	13.2	-	20.0	18.3
Community pasture Lease	19.1	7.5	13.9	8.4	2.9	8.0	12.7	13.2
No Response	52.0	57.9	76.9	51.5	58.6	10.8	60.0	58.2
Community pasture Lease	54.2	56.2	49.9	83.3	81.4	53.3	51.2	58.3

<sup>a</sup> 1. Security of tenure: Security of tenure should be increased. Since land is publicly owned, the government should at least assist in its improvement and should also protect the equity of the operators in the improvements when the lease is discontinued. Also, operators who are close to the maximum amount of public grazing should not be penalized for making improvements.

continued



Table 30 (continued)

- a 2. Rental Rates: Rental rates are too high--at least they are not low enough to warrant improvement at the user's expense.
- 3. Carrying Capacities: Grass is frequently wasted or overgrazed. Annual adjustments of the carrying capacity would eliminate this situation.
- 4. Management Freedom: Users of public land should be given more freedom, especially in making improvements and also in control of trespassers and in placing upper limits on number of animals grazed on public land.
- 5. Miscellaneous.



Finally, operators were asked "How many cattle should one individual owner be permitted to graze on the public land?" Community pasture patrons had a wider range of averages for this figure (235 head in Region V to 680 head in Region VIII in Table 31) and a smaller provincial average than did the leaseholders. These figures are biased downwards because responses of no limit could not be included when calculating the averages.

There is a very large physical potential for pasture improvement on owned land and especially on leased pastureland. Of greater significance though, a larger proportion of owned land was physically improved in 1965 as well as in 1961-64 (see Appendix I, Tables 5 and 6) even though proportionately more of the leased land was considered to be profitable to improve. This situation in itself implies that, under recent and current government policies of grazing lease tenure, operators have not felt that it was in their best interests to proceed with these physical improvements at a rate that would allow the productivity of public pastureland to be increased as rapidly as that of privately owned pastureland. In view of the projected increase in beef output and consequent forage requirements, it is essential that increases in the productivity of public pastureland occur at a rate that is significantly greater than previously. One method of achieving this goal would be for the provincial government to undertake the improvements and then recoup their investment from the additional rentals generated by increases in forage production on these lands.



Table 31  
RESPONSE TO QUESTION: HOW MANY CATTLE SHOULD ONE INDIVIDUAL  
OWNER BE PERMITTED TO GRAZE ON THE  
PUBLIC LANDS?<sup>a</sup>

Grazing Region	I	II	IV	V	VI	VII	VIII	Province
	(number of head)							
Community pasture	376	268	497	253	458	680	511	371
Lease	464	493	431	363	365	434	499	452

<sup>a</sup> These figures are averages that exclude non-response and responses of no limit.



## CHAPTER IV

### THE LINEAR PROGRAMMING ANALYSIS AND AN ALTERNATIVE SOLUTION

#### The Model

The third and final objective of this study was to determine the most economical method within the several grazing regions, to improve the productivity of publicly controlled pastureland. Achievement of this objective will assist in meeting additional animal nutrients for the projected increase in demand for beef.

Goundry<sup>1</sup> and other writers have emphasized the necessity of utilizing capital theory when dealing with natural resources. He explains that of the three factors commonly considered fixed, "land," "enterprise," and "capital," it is capital that imparts diminishing returns to the variable factors of land and enterprise (which are paid the value of their marginal products) and receives the residual or rent. Maximum benefits to society occur when the fixed factor capital (or command over resources in general) is allocated in such a manner that the rate of growth of capital, i.e. the return on investment, is maximized over all alternative investments. A useful tool in achieving this objective is the linear programming technique. The linear programming model used in this study considered the various possible improvement practices throughout the province as alternative investments and only those that produced a minimum of 5 percent return on investment entered the solution.

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<sup>1</sup> Gordon K. Goundry, "Forest Management and the Theory of Capital," Canadian Journal of Economics and Political Science, XXVI (August, 1960), 444-451.



The only enterprise was the production of additional AUM's of forage (which ultimately would be converted to beef). Productivity, acreages, and improvement costs of each of the grazing zones (which correspond with productivity zones) within the grazing regions were derived. The application of three price levels to the forage produced by the improvements then provided the model with a basis for selecting the pattern of improvement that would be undertaken according to capital theory. In summary, the model considered pasture improvements as investments of scarce capital and allowed only those areas to be improved in which added returns were greater than the additional costs incurred in improving them.

#### Derivation of Coefficients

A review of the range management literature written on the Northern Great Plains over the last forty years provides some insight into strengths and weaknesses of various ecological systems when subjected to different patterns of grazing. In essence range management is the selection of a grazing system that works with nature to exploit the desirable characteristics of a pasture and simultaneously minimize its weaknesses. The use of domestic species in conjunction with native grasses offers many possibilities for obtaining this end.

Numerous studies indicate crested wheatgrass and Russian wild-rye out produce native grasses. Smoliak<sup>1</sup> reported that over ten years yearling ewes gained an average of 8.3 pounds per acre on Russian wild-rye, an increase of 317 percent over short-grass native range. This

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1 S. Smoliak, "Grazing Studies on Native Range, Crested Wheatgrass, and Russian Wildrye Pasture," Journal of Range Management, XXI (January, 1968), 47-50.



difference was even more pronounced when yields per acre for early spring grazing on cultivated grasses were compared to native grass. At Swift Current Campbell<sup>1</sup> reported gains by yearling ewes on crested wheatgrass-alfalfa of 55 pounds per acre, which was 5.9 times as productive as native range. Gains on crested wheatgrass-alfalfa early spring pastures were 135 pounds of beef per acre as opposed to 35 pounds of beef per acre for native grass<sup>2,3</sup> at Mandan, North Dakota. There Rogler and Lorenz showed that yields of beef per acre could be increased by one third over those of cultivated grasses by including alfalfa in the mixture and that the legume would remain in the mixture if grazed intensively over a relatively short period of time.<sup>4</sup> Alfalfa dry-matter production per acre increased from 10 percent to 37 percent of the total after ten years by using a grazing system that allowed an average of 38 days of annual spring use, because the alfalfa root reserves were allowed to be restored and thereby protect the plant. Similarly stands of crested wheatgrass and Russian wildrye grass were not damaged at Manyberries by intensive spring

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<sup>1</sup> J.B. Campbell, "Continuous Versus Repeated-Seasonal Grazing of Grass-Alfalfa Mixtures at Swift Current Saskatchewan," Journal of Range Management, XIV (March 1961), 72-77.

<sup>2</sup> J.T. Sarvis, "Grazing Investigations on the Northern Great Plains," Bulletin 308 (Mandan, North Dakota: Northern Great Plains Field Station 1942), pp. 104-107.

<sup>3</sup> W.C. Whitman, et al, "Crested Wheatgrass and Crested Wheatgrass-Alfalfa Pasture for Early Season Grazing," Bulletin 402 (Dickinson, North Dakota: North Dakota Experiment Station 1962), pp. 10-19.

<sup>4</sup> G.A. Rogler and R.J. Lorenz, "Pasture Productivity: Crested Wheatgrass as Influenced by Nitrogen Fertilization and Alfalfa," USDA Technical Bulletin 1402 (Mandan, North Dakota: Northern Great Plains Field Station 1966), pp. 19-20.



grazing.<sup>1</sup>

Research results on native range in Canada and North Dakota indicate that production could be increased 45 percent by refraining from grazing it until mid-June.<sup>2,3</sup> It has also been shown that the nutritive value of native rangeland (especially the protein and phosphorous content) decreased substantially as the season progressed. Use of native range for fall and winter grazing must be considered as a great waste of animal nutrients, its only justification being that undervaluation enables its feasibility from an economic point of view. Hence for maximum production native grass should be grazed from mid-June until late summer.

These ecological relationships were taken into consideration in a complementary grazing system described by Lodge.<sup>4</sup> The most effective of these systems utilized crested wheatgrass and native range on a free choice basis for the remainder of the season. This complementary system produced 38.7 pounds of beef per acre as opposed to 20.1 pounds of beef per acre for native Sandhill prairie. When the additional production was attributed to the 21 percent of the total pasture acreage that was crested wheatgrass, it was shown that the tame pasture was 6.5 times more

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<sup>1</sup> S. Smoliak, Grazing Studies, 47-50.

<sup>2</sup> Canada Department of Agriculture, Range Management of Grasslands and Adjacent Parklands, (Ottawa: Queen's Printer, 1962), p. 23.

<sup>3</sup> G.A. Rogler, R.J. Lorenz, and H.M. Schaaf, Progress with Grass, Bulletin 439 (Mandan, North Dakota: Northern Great Plains Field Station, 1962), pp. 11-12.

<sup>4</sup> Robert W. Lodge, "Complementary Grazing Systems for Sandhills of the Northern Great Plains," Journal of Range Management, XVI (June, 1963), 240-244.



productive than the native range. Inclusion of alfalfa in the tame pasture would raise this figure to approximately 7.5 times that of native range. Additionally it was noted that the basal area of desirable species of native grasses was substantially increased by protection from early spring grazing.

The public grazing land is almost entirely native range used in conjunction with privately owned grazing lands. It appears to be highly desirable to provide pasture improvements so that advantages of the synergistic effect obtained with a complementary grazing system are employed. In view of these ecological principles, productivity of cultivated spring pasture was estimated in Table 32 by grazing zones.

Table 32

PRODUCTIVITY OF CULTIVATED SPRING PASTURES<sup>a</sup>

Grazing Zone <sup>b</sup>	AUM's Per Acre <sup>c</sup>
60	1.40
50	1.68
40	2.10
32	2.61
24	3.50

<sup>a</sup> Derived from a composite of research reports.

<sup>b</sup> These figures represent the acreage requirement to maintain an animal unit on a 12 month basis.

<sup>c</sup> The problem of using averages arises here. Land that is classified in a grazing zone because of tree cover will undoubtedly produce more tame forage per acre than prairie land that is classified in the same grazing zone.



In consideration of the time interval before improvements actually achieve production and then their eventual deterioration, the total increase in production over native grass for the initial twenty years of the pasture life is given in Table 33.

Table 33  
TOTAL AND AVERAGE ANNUAL PRODUCTION  
OF CULTIVATED SPRING PASTURES<sup>a</sup>

Grazing Zone <sup>b</sup>	AUM's 20 Year Total	AUM's Average Annual
	(per acre)	(per acre)
60	21.0	1.05
50	25.2	1.26
40	31.5	1.58
32	39.2	1.96
24	32.5	2.26

<sup>a</sup> Derived from a composite of research reports.

<sup>b</sup> These figures represent the acreage required to maintain an animal unit on a year round basis.

#### Improvement Practices Excluded

Not all available practices were included in this study. The provision of adequate water facilities and fencing are of such importance that their presence is required before native pastures and especially cultivated pasture can be utilized to their full potential. Hence these practices are considered to be essential for proper range management and precede further development. An investigation of increases in pasture production brought about through brush control, irrigation, and fertilization<sup>1</sup> showed that these increases were provided at a substantially

<sup>1</sup> McMillan, op. cit., p. 69



Table 34

## ACREAGES AVAILABLE FOR IMPROVEMENT PRACTICES BY GRAZING REGION

Grazing Region	Improvement Practice	24	32	40	50	60
		(in thousands)				
I	Break and reseed to tame pasture Clear, break, and reseed		33.3 23.7	7.0	698.3	
II	Break and reseed to tame pasture Clear, break and reseed		8.0 .8	6.2	70.9	
IV	Break and reseed to tame pasture Clear, break and reseed	10.4 56.9	13.9 75.6		2.5	
V	Break and reseed to tame pasture Clear, break, and reseed		50.0 31.9	20.7 12.9	14.2	
VI	Break and reseed to tame pasture Clear, break, and reseed		23.5 47.9		8.3 16.9	
VII	Break and reseed to tame pasture Clear, break, and reseed				15.3 162.1	
VIII	Break and reseed to tame pasture Clear, break, and reseed					14.6 243.2



higher cost per AUM than by reseeding pasture to tame grass. Because of their higher costs per AUM these practices were deleted from further consideration because it was evident that they would not enter the linear programming solution.

The estimates for acreage of improvements may well be lower than what is physically possible. Johnston<sup>1</sup> estimates 30 percent of the existing rangeland could be reseeded. Estimates of acreages of public land available for improvements other than the two types of leases were not made. Additional grazing facilities could be obtained by more economical means than brush control, irrigation, or fertilization through use of the lower-cost improvement practices on a larger acreage.

#### Acreages Available for Improvement

Estimates of various grazing zones acreages within grazing regions that are available for the selected improvement practices are given in Table 34. These figures were derived from Table 15 and in most instances resulted directly from the assumption that the sample was evenly dispersed throughout the grazing region such that acreage available for improvement in each grazing zone would be in the same proportion as their respective total acres.

#### Improvement Costs

Improvement costs were derived from those reported by McMillan<sup>2</sup> except that initial costs of clearing, breaking, and seeding pastureland in Regions, I, II, IV, and V were based on the average cost of the Black

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<sup>1</sup> Alex Johnston, "More Reseeding of Native Range Urged by Rangeland Specialists," Lethbridge Herald, February 21, 1961, p. 5.

<sup>2</sup> McMillan, op. cit., p. 141, 143.



Table 35

TOTAL INITIAL COST PER ACRE OF IMPROVEMENT PRACTICES

Improvement Practice	I	II	IV	V	VI	VII	VIII
	(dollars)						
Break and seed to tame pasture	6.87	6.87	10.83	9.27	10.14	10.18	10.18
Clear, break, and seed	39.62	39.62	39.62	39.62	41.03	38.22	38.22

Table 36

ANNUAL COST PER ACRE OF IMPROVEMENT PRACTICES

Improvement Practice	I	II	IV	V	VI	VII
	(dollars)					
Break and seed to tame pasture	.91	.91	1.44	1.23	1.35	1.35
Clear, break, and seed	5.26	5.26	5.26	5.26	5.44	5.07



Figure 11

## LINEAR PROGRAM MATERIAL

[illegible]

1 This matrix can be converted to Matrix (R) and Matrix (S) by replacing the 26 profit row coefficients in the submatrices and the 26 profit row coefficients in row 50 (L) with corresponding Matrix (R) and Matrix (S) values.



and Grey Wooded Regions. Initial costs were compounded at 5 percent over twenty years, and the average annual cost was computed from this figure. These costs are given in Table 35 and Table 36.

### Price Levels

The model was utilized to investigate the effect of valuing at different levels, the increase in production brought about by the various improvement practices. Matrix L. used as its price the weighted average rental per AUM received by the Departments of Lands and Forests and Municipal Affairs for an AUM of unsupervised grazing in the period 1960-1968. The solution to this matrix indicates acreages of profitable improvements to public grazing land under existing prices. The price level used by Matrix R was the average rental per AUM<sup>1</sup> paid to private landowners throughout the province and represented an attempt to utilize a figure that more nearly represented the market value of an AUM of grazing. Matrix S used a rental figure representative of the substitute value of feed (which is the greatest amount that can be charged for pasture before other methods of feeding livestock can be provided at a lower cost.) This price would be the average value of the feed required for an AUM of maintenance ration for a beef cow under drylot conditions (Appendix I, Table 52). Four dollars and twenty-four cents per AUM was selected as a conservative estimate for this figure.

### Interpretation of the Matrix

The matrix was composed of seven submatrices, each one representing a grazing region. Activities in any submatrix were alternative

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<sup>1</sup> McMillan, op. cit., p. 27.



methods of producing and selling forage. Constraint limited acreages of land for improvement and prevented negative outputs of production and negative investment. Slack variables allowed non-use of resources while simultaneously avoiding the inclusion of inequalities. These points are clarified by using Submatrix I of Figure II representing Grazing Region I in Matrix L as an example.

Beginning with the activities, Column 1 indicates that one unit (scaling was to a basis of 1,000 acres) of Reseed 50 (break and reseed in the 50 acre zone) could produce 1,280 AUM's of grazing annually and would require an initial outlay of \$6,870. This practice would produce an annual profit of \$20 per 1,000 acres improved. The coefficients are repeated again in Row 48 and 49 and in the objective function where they contribute to the provincial totals, i.e. the coefficients of the submatrices are combined and interrelated to provide a provincial matrix. The objective function was derived from the profit rows of the submatrices which in turn were calculated by subtracting annual costs from annual revenues. Thus the objective function coefficients represent net returns from each improvement practice. The solution of the matrix was the maximization of this objective function subject to specified constraints. Row one restricts the number of 1,000 acre units of the activity R50 (Column one) plus the units of non-use activity (Column 27) to not greater than 698.3 or 698,300 acres. The second, third, and fourth rows or constraints are interpreted in a similar manner. Row 5 indicates that one unit of R50 provides 1,260 AUM's of forage and that R40 (Column two), R32 and C32 produce 1,580, 1,960 and 1,960 AUM's of grazing per unit respectively. Also Row 5 inserts the constraint that the sum of the



output of the activities must be non-negative. The outlay row prevents negative investment by forcing the sum of the initial investments (which are negative in sign because they represent the use of resources) and their corresponding slacks to be not greater than zero. In a similar manner Row 7 allows only those enterprises that add to profit to enter the solution.

The matrix in its present form can readily be modified to include other constraints. For example, a limit on the amount invested in any one region would be implemented by adjusting the right-hand side of the outlay row to the desired level of investment and reversing the inequality. If a certain level of grazing output were deemed desirable for all regions, these levels would simply be inserted into the right-hand side of the equation in the AUM row for each submatrix. Appropriate changes would also be required in the provincial total rows for AUM and outlay.

### Solution to the Matrices

#### Solution to Matrix L

The final solution of Matrix L justified on an economic basis the investment of \$6,623,800 in breaking and reseeding 921,500 acres of native grassland. This land would annually produce 1,165,800 AUM of grazing at a profit of \$57,100. The majority of this investment would occur in the open prairie land of Region I, where 738,600 acres would annually produce 956,200 AUM of additional grazing. Although output per acre would be similar to Southern Regions, breaking and reseeding does not occur in Region VII and VIII because of their higher development costs.



### Solution to Matrix R

The solution of Matrix R did not vary appreciably from Matrix L in acreage and type of improvement. It recommended that 997,100 acres be broken and reseeded to a grass-legume mixture for use in complementary grazing. From an initial investment of \$7,362,900 an annual profit of \$1,102,200 would be generated from the rental on 1,364,600 AUMs of grazing. Here again clearing of wooded areas and reseeding to tame varieties did not prove to be economical, although all available land that could be improved was broken and reseeded.

### Solution to Matrix S

When the higher price levels of Matrix S were applied to the problem, all break and reseed activities entered as before but at an extremely high level of profitability. Additionally, 411,800 acres of the more productive areas became economical to clear and reseed and aided in producing a total profit of \$5,656,400. An initial outlay of \$23,518,700 was required to provide 2,070,400 AUM's of additional grazing annually.

### Sensitivity Analysis

Table 40 indicates the percent that annual returns are of average annual costs for each of the improvement practices in the various grazing zones for each of the three price levels. It gives the relative profitability of the various practices and can be used to provide sub-optimal information that makes the final or optimal solution more meaningful. For example, in Matrix L the practices break and reseed in Zones 50, 40, and 32 in Grazing Regions I, II, and IV, respectively, enter the solution on a borderline basis. (These factors add little to



Table 37

## SOLUTION TO MATRIX L

Grazing Region	Break and Reseed Acreage	AUM's Produced	Annual Profit	Initial Outlay
	(in thousands)			
I	738.6	956.2	\$ 33.8	\$ 5,074.2
II	85.1	114.8	7.4	584.6
IV	24.3	50.7	2.5	263.2
V	50.0	98.0	11.0	463.5
VI	23.5	46.1	2.4	238.3
Province	921.5	1,265.8	57.1	6,623.8



Table 38

## SOLUTION TO MATRIX R

Grazing Region	Break and Reseed Acreage	AUM's Produced	Annual Profit	Initial Outlay
	(in thousands)			
I	738.6	956.2	\$ 784.6	\$ 5,074.2
II	85.1	114.8	97.4	584.6
IV	26.8	53.9	43.4	290.2
V	84.9	148.6	121.5	787.0
VI	31.8	56.5	43.0	322.5
VII	15.3	19.3	8.7	155.8
VIII	14.6	15.3	3.6	148.6
Province	997.1	1,364.6	1,102.2	7,362.9



Table 39

## SOLUTION TO MATRIX S

Grazing Region	Break and Reseed Acreage	Clear, Break, and Reseed Acreage	AUM's Produced	Annual Profit	Initial Outlay
(in thousands)					
I	738.6	23.7	1,002.6	\$ 3,452.7	\$ 6,013.2
II	85.1	.8	116.4	411.6	616.0
IV	26.8	132.5	330.7	666.3	5,539.9
V	84.9	44.8	231.5	641.5	2,562.0
VI	31.8	47.9	150.4	334.2	2,287.8
VII	15.3	162.1	223.5	104.8	6,351.2
VIII	14.6	--	15.3	45.3	148.6
Province	997.1	411.8	2,070.4	5,656.4	23,518.7



annual profit and require substantial initial investments.) Break and reseed 40 in Region V did not enter the solution, although its annual returns covered 95 percent of its annual costs. When the rental per AUM was approximately doubled as in Matrix R, all break and reseed activities entered the solution at profitable levels, while all clearing activities still failed by a substantial amount to cover costs. As was expected, further increasing returns per AUM in Matrix S enabled all breaking and reseeding activities to be extremely profitable and the clearing activities, which were carried out on more productive land (in 40, 32 and 24 acre grazing zones), to enter the solution in all grazing regions.

Table 40 can be interpreted in another way. At a given price level it indicates the relative costs of improvements due to the fact that the more "profitable" improvements represent a less expensive source of grazing capacity. Figure III indicates the amount of additional forage production that would be economical over the range of rentals per AUM between \$.74 and \$4.24.

#### An Alternative: The Short Season Grazing System

There is an alternative solution to the problem of increasing the productivity of Alberta's pastureland. The restriction of grazing native grass to mid-June until September would raise the forage-producing capacity of the public land by up to 50 percent.<sup>1</sup> More importantly the net result of Short Season grazing would be to shift the onus for

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<sup>1</sup> Canada and Saskatchewan Departments of Agriculture, Guide to Farm Practice in Saskatchewan, (Regina: Saskatchewan Dept. of Agriculture, 1966), p. 69.



Table 40

ANNUAL RETURNS FROM IMPROVEMENTS AS A PERCENTAGE OF ANNUAL COSTS<sup>1</sup>

Grazing Region	Grazing Zone	Improvement Practice	Price Level		Substitute Value (S)
			Lease (L)	Private Rental (R)	
			(percent)	(percent)	(percent)
I	50	Break and reseed	102	211	587
	40	Break and reseed	129	264	736
	32	Break and reseed	159	327	913
	32	Clear, break, and reseed	28	57	158
II	50	Break and reseed	102	211	587
	40	Break and reseed	129	264	736
	32	Break and reseed	159	327	913
	32	Clear, break, and reseed	28	57	158
IV	50	Break and reseed	65	133	371
	32	Break and reseed	101	207	577
	32	Clear, break, and reseed	28	57	158
	24	Break and reseed	116	239	665
	24	Clear, break, and reseed	32	65	182
V	50	Break and reseed	76	156	434
	40	Break and reseed	95	195	545
	40	Clear, break, and reseed	22	46	127
	32	Break and reseed	118	242	676
	32	Clear, break, and reseed	28	57	158

continued



Table 40 (continued)

Grazing Region	Grazing Zone	Improvement Practice	Price Level			Substitute Value (\$)
			Lease (L)	Private Rental (R)		
			(percent)	(percent)	(percent)	
VI	50	Break and reseed	69	142		396
	50	Clear, break and reseed	17	35		98
	32	Break and reseed	107	221		616
	32	Clear, break, and reseed	27	55		153
VII	50	Break and reseed	69	142		396
	50	Clear, break, and reseed	18	38		105
VIII:	60	Break and reseed	58	119		330
	60	Clear, break, and reseed	15	32		88

<sup>1</sup> Annual return from improvements are the average AUM's per acre (from Table 33) multiplied by the appropriate price level. Annual costs are those displayed in Table 36.



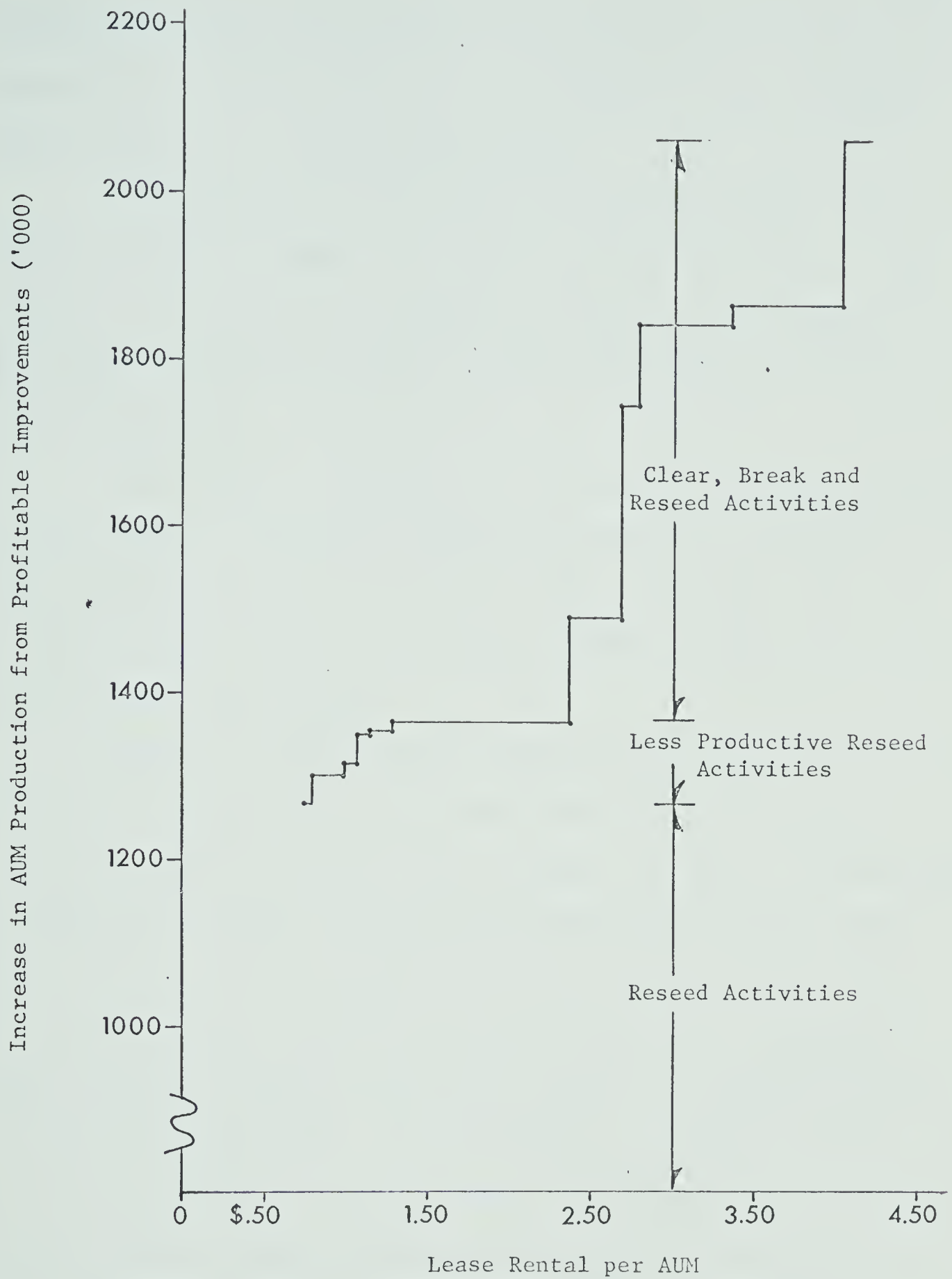


Figure III

RELATIONSHIP BETWEEN LEASE RENTAL AND WARRANTED PASTURE IMPROVEMENTS



providing additional spring pasture to the private sector of the economy. Implications of the Short Season are delineated on the basis of Wood's specific objectives for Alberta land policy.

The productivity of the biological resource of plant cover is actually increased through the application of the Short Season. Lodge reported that increases in the proportion of desirable plant species on native Sandhill prairie range were directly attributable to protection from spring grazing.

A substantial increase in net returns will be achieved through the Short Season. Production of forage and consequently rentals will be raised without an increase in rental per AUM. Additionally there will be a considerable reduction in the waste of animal nutrients that is incurred through winter grazing.

Another result of the Short Season grazing system would be the pasturing of approximately twice as many cattle (Table 41) on public land but for a shorter length of time. A major deterrent to the expansion of cowherds (and thereby farm incomes) on mixed-farming type of operations is the lack of low-cost summer grazing. The provision of part of the increased output of public pastureland in the form of cooperative summer pasture will greatly enhance the potential for cowherd increases on mixed farming operations. The availability of community pasture on a more localized basis will reduce problems currently associated with more extensive forms of communal grazing--cattle disease, lost cattle, and high transportation costs. Leaseholders will not be affected greatly by

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<sup>1</sup> Wood, op. cit., p. 5

<sup>2</sup> Lodge, op. cit., p. 240-244.



the Short Season unless their leased native grass constitutes a large proportion of their total pastureland. In this situation considerable adjustment will be required. This adjustment, one major shortcoming of the Short Season grazing system, must then be weighed against its expected benefits to society. In making such a decision, it is important to refrain from undervaluing economies of size in the ranching industry. Current policies (4,800 and 7,200 AUM limits) would require the reduction of the size of many leases if the Short Season were implemented. Although on a provincial basis fall grazing is not a limiting fact because of stubble grazing, both lessees and communal pasture would be faced with a much greater requirement for spring pasture. Table 41 gives the production gains to be expected by the adoption of the Short Season grazing system; over one-half million animal units can be provided with summer grazing on public lands. When cattle numbers are increased by this amount (and this will occur by 1977), over 800,000 AUM's of additional spring grazing will be required. This spring pasture would be provided by the physical improvement of public grazing land and privately owned pastureland and by the reseeding of cropland to tame pasture. Operators reported 825,000 acres of cropland available for conversion to pastureland.<sup>1</sup> A little used technical relationship is that by using yearling cattle it is possible to produce nearly as many pounds of beef per acre from properly managed perennial and annual pasture as can be obtained from the grain produced on similar land. The application of the productivity estimates from Table 32 to the cropland acreage reported as possible to develop for pasture adds

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<sup>1</sup> McMillan, op. cit., p. 36.



perspective to the whole question of range reseeding.

Table 41

EFFECT OF THE SHORT SEASON SYSTEM ON PUBLIC AUM'S  
SUPPLIED, ANIMAL UNITS GRAZED, AND ADDITIONAL  
SPRING PASTURE REQUIREMENTS<sup>a</sup>

Item	Current Capacity	Effect of Short Season	Percent Increase
Alberta public AUM's <sup>b</sup>	2,766,200	3,872,700	40.0
Animal Units grazed	553,200	1,106,500	200.0
Additional spring AUM's required		829,800	

Operators have proven to be reluctant to make improvements on leased land mainly because of feelings of insecurity about the tenure of the lease or their equity in improvements. Either tenure conditions must be changed in order to entice operators to improve the public land or more coercion introduced if more extensive improvement of the public land is sought within the framework of existing policies. Requiring that public land be used in its most productive stage of growth (as opposed to some manner of government participation in making physical improvements on leased land) can be considered as introducing a greater level of freedom, equity, and security into the land tenure system.

<sup>a</sup> This table was constructed on the assumption that the Short Season system will increase carrying capacity by 40 percent and reduce the grazing season from 5 to  $3\frac{1}{2}$  months and that the spring grazing period is  $1\frac{1}{2}$  months.

<sup>b</sup> Excluding Indian Reserves.



Productivity of the public land will be increased without considerable investment by either the users or the owners of the land. Additionally cattlemen will have the opportunity to undertake improvements on their own land without government intervention and under the guidance of Adam Smith's "invisible hand". Possibly operators could make physical improvements (other than clearing) on their own land at a lower cash outlay than, for instance, the contract method that would be used on any large-scale government sponsored improvement program, mainly because in the economic short run (i.e. with a given stock of capital equipment) fixed costs of ownership need not be included in considering costs of improvement. Present assistance programs would still be utilized in making improvements, particularly water development.

The adoption of the Short Season grazing system and its concomitant increased spring pasture requirements could facilitate the over-all Canadian agricultural policy of reducing wheat production. Moreover, this system would exert a strong, immediate, and positive impetus to increase forage output and, thereby, the production of beef. Through more widespread use of cultivated pastures, more efficient methods of preserving forage crops and performance selection in cattle, costs of producing beef can be lowered. As a result of these lower prices, beef sales will be enhanced both on the Canadian and the export market.



## CHAPTER V

### SUMMARY AND CONCLUSIONS

The Canadian agricultural industry is currently faced with the problem of diverting resources out of the production of wheat while simultaneously avoiding decreases in farm income. Increasing the output of beef will accomplish part of this goal. It is estimated that levels of forage requirements for beef production will be 40.7 percent higher in 1980 than they were in 1967. Since 21.8 percent of all grazing in the province was provided (1966) by publicly owned land, government policies regarding this land have significant effects in Alberta's livestock industry.

In 1966 there were an estimated 11,322,100 acres of publicly owned pastureland in Alberta, which produced 2,978,500 AUM's of grazing. Excluding Indian Reserves 76.2 percent of this acreage (81.2 percent of the total AUM's) was administered by the Department of Lands and Forests as grazing leases, grazing reserves; and the Department of Municipal Affairs' Special Areas' grazing leases. A survey of 704 users of this land provided data for analysis of its use and management. In addition to use of the public lands these public land patrons utilized 4,393,500 acres of pastureland owned by the private sector of the economy. Of the total public users' pasture acreage, 85.4 percent was unimproved native grass.

Rentals on approximately 81 percent of the public land were levied on a per acre basis. The acreage rental averaged \$0.7427 per AUM as opposed to an average \$1.52 per AUM that the private sector of the



economy, received for similar unsupervised grazing. This pricing difference previously investigated by Hanson<sup>1</sup> and Forbes<sup>2</sup>, in effect, constitutes a direct subsidy to the users of this land. Increases in per AUM rental rates on the public grazing lands are long overdue. The recently introduced assessment for municipal taxation of these lands will partially rectify the situation.

There were two basic methods in which the public grazing land was utilized. Approximately 79.2 percent of the total public AUM's was administered in the form of a lease or grazing permit made to individual operators. The remaining 20.8 percent of grazing was utilized in the form of collective grazing. Under the "communal" arrangement either leases or grazing permits were issued to groups of cattlemen who grazed the land on a cooperative basis (usually for a four-to-six month period during the summer), or government supervised collective grazing was provided for summer pasturage. Although the "average" communal grazier had greater cattle sales in 1965 than did the average leaseholder, their average cattle numbers as of January first, 1966, were very similar. Leaseholders had considerably more pasture acreage than their counterparts, but because much of the additional pastureland was native grass, its productivity was only 53.3 percent of the pastureland of community pasture patrons. Communal graziers owned 61.7 percent of their pastureland compared to 26.5 percent for lessees.

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<sup>1</sup> Alberta Department of Municipal Affairs, Report of the Special Areas Investigation Committee, (Edmonton: Special Areas Investigation Committee, 1961), p. 18 and 24.

<sup>2</sup> Forbes, op. cit., p. 47.



Operators' estimates of acreage of pastureland that could be profitably improved indicated a very large potential for pasture improvement in both owned land and public grazing leases. A total of 2,439,400 acres could profitably be physically improved, of which 1,847,900 acres was leased land. It was found that a considerably larger proportion of owned pastureland was physically improved between 1961 and 1965 even though proportionately more of the leased land was considered profitable to improve. Amount of expenditure on physical improvement of leased pasture increased as the size of lease increased but conversely, the expenditure per acre decreased as lease size increased. Both types of public land users agreed by a large majority that the grazing capacity of the public land should be increased. To obtain this increased capacity, communal graziers favored the alternative of the province undertaking the improvements by contract and increasing rentals to cover costs. Lessees were not clearly in favor of any of the suggested five alternative programs for obtaining improvement. The most predominant response given by lessees when asked why they were not in favor of mandatory improvement of public leases was that investments in improvements were too risky because of the insecurity of tenure of grazing leases. These feelings of insecurity are the greatest problem to be overcome if it is deemed desirable for lessees to make more improvement on their leases than has been done in the past. The upper limits on public grazing (4,800 AUM's in the Special Areas and 7,200 AUM's in the Department of Lands and Forests) would cease being a deterrent to improvement by more extensive public land users if this limit were applied only to native grass.

Approximately one half of the public land users reported dissatisfaction with 1966 methods of public grazing land management. Community pasture patrons expressed a desire for annual adjustments in carrying



capacity ratings of leases. Leaseholders, on the other hand, wanted changes in management that would increase the security of lease tenure and give them more protection for their equity in improvements in leases.

A linear programming model was developed in order to apply the principle of maximizing returns to capital to the problem of increasing the production of Alberta's public grazing lands. If native pasture were to be reseeded to cultivated pasture in order to increase output, the greatest production per acre (and thereby the least-cost source of additional AUM's of grazing) would be acquired from spring pastures. Through the use of these new spring pastures, grazing of native pasture could be deferred until mid-June. On the basis of 1965 operator reported improvement costs, with the value of additional output of native grass attributed to the presence of spring cultivated pasture, all but the least productive unwooded areas of the province can be profitably broken and reseeded at current lease rental rates. An additional 1,265,800 AUM's could be provided in this manner. By raising rentals to \$1.28 per AUM, all available prairie land that was feasible to improve could be profitably broken and reseeded. A further increase to \$2.35 per AUM would be required to justify even the most productive wooded land being cleared, broken, and reseeded. Probably the most important contribution of the analysis was the presentation of the principle that additional AUM's must be derived from the least-cost source.

An alternative approach for increasing the productivity of the public land is provided by the concept of the Short Season grazing system. Restriction of the grazing season on public native grass pastures from mid-June until September would result in an increase of up to 50 percent



in its productivity and simultaneously shift the onus for development of additional spring pasture onto the private sector of the economy, thereby exerting a strong positive force toward expanding Alberta's beef industry. The competitive position of beef in the Canadian and foreign markets will be enhanced by the general adoption of existing cost-reducing technology by the beef industry.



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## APPENDIX I



Table 42

ACTUAL USAGE AND CALCULATED USAGE ON COMMUNITY PASTURE  
IN THE SPECIAL AREAS ON DRYLAND GRAZING RESERVES

Pasture Type	Year	AUM Capacity	AUM used	Used Percent Capacity
Community pastures Special Areas	1965	42,630	51,282	120.3
Community pastures Special Areas	1966	43,132	49,341	114.4
Grazing reserves	1965	36,865	42,978	116.6

Source: Alberta Department of Municipal Affairs, "Minutes of the Special Areas 1965 Fall and 1967 Spring Advisory Committee Meetings," Hanna, Alberta, 1965 and 1967. (Mimeographed).



Table 43

## AVERAGE FARM ACREAGES BY TENURE

Tenure	I	II	IV	V	VI	VII	VIII	Province
	(acres)							
Owned and operated	1,297	573	1,000	879	555	392	688	771
	1,227	1,378	1,156	1,209	458	533	537	909
Rented	162	138	238	202	168	45	239	171
	107	335	115	135	37	103	112	110
Leased	616	321	99	103	19	18	0	244
	2,765	3,643	1,213	855	641	545	732	1,557
Total	2,075	1,032	1,337	1,184	742	455	927	1,186
	4,099	5,356	2,484	2,199	1,136	1,181	1,381	2,576



Table 44

## ACREAGE LEASED FROM CROWN OR PUBLIC SOURCES BY SIX SIZE GROUPS

Acres	I	II	IV	V	VI	VII	VIII	Province
	(percent)							
0 - 640	80.6 33.6	95.4 29.3	92.6 69.7	96.9 71.1	99.7 79.4	100.0 86.0	100.0 65.0	93.9 56.9
641 - 1,280	7.8 22.3	1.0 3.8	6.9 14.2	3.1 17.7	.3 6.8	- 1.9	- 18.3	2.8 15.4
1,281 - 1,920	3.9 14.2	1.8 7.3	- 2.8	- 5.9	- 6.8	- 5.6	- 11.0	1.3 9.6
1,921 - 3,200	1.9 15.3	- 18.5	- 2.8	- 1.4	- 3.4	- 3.7	- 3.7	.3 8.4
3,201 - 5,760	1.9 5.8	- 21.9	.5 5.7	- 1.4	- 3.4	- 2.8	- 1.8	.4 4.8
Greater than 5,760	3.9 8.8	1.8 19.2	- 4.8	- 2.4	- .2	- -	- .2	1.3 4.9



Table 45

## TOTAL ACRES IN OPERATION BY SIX SIZE GROUPS

Acres	I	II	IV	V	VI	VII	VIII	Province
	(percent)							
0 - 640	15.2 6.5	65.2 7.3	41.1 14.3	38.5 5.9	54.2 38.8	83.4 39.3	30.0 24.8	47.5 17.6
641 - 1,280	36.4 18.6	16.4 -	33.5 26.9	28.8 25.2	41.6 44.0	16.6 31.7	60.0 32.9	30.3 25.6
1,281 - 1,920	19.2 20.1	7.0 14.6	11.5 17.0	19.1 29.6	3.7 3.4	- 15.0	10.0 20.1	10.2 18.3
1,921 - 3,200	15.5 26.6	7.0 11.2	.5 22.9	12.7 22.2	.5 6.8	- 5.6	- 20.1	6.5 19.5
3,201 - 5,760	9.8 14.6	2.6 25.8	11.5 11.3	.9 13.3	- 6.8	- 7.5	- 1.8	4.0 10.9
Greater than 5,760	3.9 13.6	1.8 41.1	1.9 7.6	- 3.8	- .2	- .9	- .3	1.5 8.1



Table 46

## PASTURE IMPROVEMENT PRACTICES MADE ON OWNED LANDS 1961-64

Pasture Improvement Practice	I	II	IV	V *	VI	VII	VIII	Province
	(thousands of acres)							
Reseed to tame grass and/or legume	52.1	15.1	21.9	7.7	2.4	3.9	2.6	105.7
Clear brush and trees and reseed	-	-	4.8	1.3	11.1	2.3	1.3	20.8
Fence to control special vegetation	.2	-	10.5	-	-	2.4	5.9	19.0
Rotational grazing	95.1	16.0	1.9	-	2.6	2.0	10.6	128.2
Distributes grazing with salting locations	22.9	-	4.4	-	-	-	-	27.3
Development of additional water facilities	57.2	-	36.0	3.2	22.3	5.4	8.8	132.9
Construction of diversion terraces	3.3	2.9	3.0	-	.2	-	-	9.4
Drainage of swampy areas	-	-	-	-	1.4	.5	-	1.9
Fertilizer application	.3	25.1	1.5	-	6.5	21.1	23.0	77.5
Control weeds and poisonous plants	15.1	1.3	9.1	-	-	-	-	25.5
Brush control	-	-	5.5	-	1.8	4.0	-	11.3
Fencing to utilize pasture and forage crop combinations	-	-	-	-	9.7	-	.4	10.1
Feeding concentrates to grazing animals	74.7	-	-	-	-	-	-	74.7
Reseed cultivated land	3.2	-	2.7	-	-	-	.6	6.5
Total owned pastureland	1,705.8	490.2	713.3	522.9	306.8	225.8	127.5	4,092.3



Table 47

## PASTURE IMPROVEMENTS MADE ON GRAZING LEASES 1961-64

Pasture Improvement Practice	I	II	IV	V	VI	VII	VIII	Province
				(thousands of acres)				
Reseed to tame grass and/or legume	43.5	14.6	35.3	6.8	-	-	5.1	105.3
Clear brush and trees and reseed	-	-	1.0	-	1.2	2.4	2.5	7.1
Fence to control special vegetation	.2	-	14.3	-	-	3.9	31.8	50.2
Rotational grazing	181.2	26.2	-	-	-	-	-	207.4
Distribute grazing with salting locations	-	-	73.5	-	-	-	-	73.5
Development of additional water facilities	228.9	53.4	50.4	25.7	13.0	6.2	11.8	389.4
Construction of diversion terraces	-	1.1	-	-	-	-	-	1.1
Drainage of swampy areas	.6	-	-	-	.4	-	-	1.0
Fertilizer application	-	-	-	-	-	-	-	-
Control weeds and poisonous plants	-	-	3.0	-	-	-	.3	3.3
Brush control	-	-	.3	-	.3	17.4	-	18.0
Fencing to utilize pasture and forage crop combinations	20.4	-	22.0	-	-	-	-	42.4
Feeding concentrates to grazing animals	95.6	-	-	-	-	-	-	95.6
Reseed cultivated land	.7	-	-	-	-	-	-	.7
Total leased pastureland	5,199.8	947.5	654.9	451.6	294.0	440.2	539.2	8,527.2

Note: These estimates are for grazing land leased to individuals only.



Table 48

## AMOUNT OF EXPANSION PLANNED FOR OPERATIONS GIVEN IN TABLE 12

Amount of Expansion	I	II	IV	V	VI	VII	VIII	Province
	(percent)							
None	44.2 59.5	42.3 64.6	35.4 50.9	74.0 63.0	54.1 62.8	10.9 46.8	70.0 43.1	48.6 55.0
10 percent	7.7 10.2	6.9 .6	17.4 3.0	6.4 11.9	10.5 3.4	- 16.8	20.0 -	9.6 8.1
25 percent	17.3 13.1	17.3 1.1	11.0 17.3	9.6 11.8	11.0 16.9	5.7 6.5	- 12.9	13.5 12.3
50 percent	19.2 7.7	22.3 14.7	8.2 5.9	.4 4.4	12.2 3.4	- 9.3	- 20.1	14.6 9.3
100 percent	11.6 9.5	11.2 19.0	28.0 22.9	9.6 8.9	12.2 13.5	83.4 20.6	10.0 23.9	13.7 15.3

Note: This table should be used to quantify Table 12 of the text.



Table 49  
1966 PASTURE ACREAGE COMPARED WITH 1965 PASTURE ACREAGE

Response	I	II	IV	V	VI	VII	VIII	Province
	(percent)							
More	5.8 2.9	12.9 .6	24.7 14.4	9.6 4.4	7.0 3.4	- 11.2	- 11.1	10.8 6.6
Less	3.8 1.5	8.7 .6	.5 3.3	- -	14.2 10.1	5.7 7.5	10.0 9.1	7.2 4.3
The same	90.4 95.6	78.4 98.8	74.8 82.3	90.4 95.6	78.8 86.5	94.3 79.4	90.0 79.8	82.0 88.8
No response	- -	- -	- -	- -	- -	- 1.9	- -	- .3



Table 50

OPERATING ADJUSTMENTS USED IN HANDLING YEAR TO YEAR  
VARIATIONS IN PASTURE PRODUCTION

Adjustment	I	II	IV	V	VI	VII	VIII	Province
	(percent)							
Buy or sell livestock each year to keep 1/3-1/2 of the vegetative cover as a carryover	3.8 12.2	19.0 27.5	5.5 13.5	25.5 3.2	3.5 3.6	- 1.9	10.0 3.7	12.0 8.5
Community pasture Lease								
Plan your livestock program so most of the pasture is used in good years; buy additional roughage in poor years	19.3 10.5	27.6 23.1	14.2 5.9	3.1 1.4	21.4 15.2	89.1 44.9	20.0 25.6	21.1 17.5
Community pasture Lease								
Plan your livestock program on the basis of average pasture yields and store surplus feed from good years to use in poor years	63.5 64.6	24.1 34.2	57.8 69.0	39.4 80.2	57.4 47.4	10.9 32.7	40.0 34.9	43.0 54.6
Community pasture Lease								
Adjust cattle numbers to grain production	3.8 3.7	12.0 .6	5.5 2.8	6.4 3.0	7.2 10.2	- 3.7	10.0 23.9	8.3 7.1
Community pasture Lease								
Others	9.6 7.9	15.6 14.6	17.0 8.8	25.6 9.2	7.0 23.6	- 11.2	10.0 8.2	13.7 10.2
Community pasture Lease								
No response	- 1.1	1.7 -	- -	- 3.0	3.5 -	- 5.6	10.0 3.7	1.9 2.1
Community pasture Lease								



Table 51

PERCENTAGE OF OPERATORS WHO HAD TRIED TO BORROW MONEY  
SPECIFICALLY FOR PASTURE IMPROVEMENT ON PRIVATE LANDS

Response	I	II	IV	V	VI	VII	VIII	Province
	(percent)							
No	98.0 93.3	93.1 97.7	92.6 88.2	87.2 96.8	77.3 76.3	88.8 88.8	90.0 98.0	90.2 91.9
	Community pasture Lease							
Yes	2.0 4.6	5.2 .6	5.5 11.3	6.4 3.0	15.7 16.9	5.6 9.3	10.0 2.0	7.0 6.3
	Community pasture Lease							
No response	- 2.1	1.7 1.7	1.9 .5	6.4 .2	7.0 6.8	5.6 1.9	- -	2.8 1.8
	Community pasture Lease							



Table 52  
CALCULATION OF THE SUBSTITUTE VALUE OF FORAGE  
SUPPLIED BY GRAZING

Item	Dry Matter (pounds)	Digestible Protein (pounds)	Digestible Energy (Therms)
Average daily nutrient requirement for 1,000 lb. beef cow <sup>a,b</sup>	23.0	1.10	26.8
Nutrients supplied by 21 <sup>c</sup> pounds of oat silage	22.7	1.28	26.9

<sup>a</sup> Source: Committee on Animal Nutrition, "Nutrient Requirements of Domestic Animals" (Washington, D.C.: National Academy of Science--National Research Council, 1963), p. 2,22.

<sup>b</sup> These requirements are the average of summer requirements for a 1,000 pound beef cow nursing a calf for three months and wintering for three months.

<sup>c</sup> By applying a price of \$3.98 per ton of silage to the monthly requirement of 2,130 pounds of silage, the substitute value of \$4.24 per AUM is derived (which coincides with the implied total value of an AUM on p. 22).



Table 53

PERCENTAGE OF OPERATORS WHO WERE ABLE TO BORROW MONEY  
SPECIFICALLY FOR PASTURE IMPROVEMENT ON PRIVATE LANDS

Response	I	II	IV	V	VI	VII	VIII	Provincial
	(percent)							
No	-	-	-	-	-	5.7	-	-
	-	-	5.7	.3	-	1.9	-	1.1
Yes	2.0	3.4	5.5	12.8	15.7	5.7	10.0	7.0
	4.6	.6	5.7	-	16.9	9.3	2.0	5.5
No response	98.0	96.6	94.5	87.2	84.3	88.6	90.0	93.0
	95.4	99.4	88.6	97.0	83.1	88.8	98.0	93.4



Table 54

RESPONSE TO STATEMENT THAT ANY INCREASE IN THE GRAZING CAPACITY OF PUBLIC LANDS SHOULD BE OBTAINED BY IMPROVEMENT OF LANDS NOW BEING GRAZED

Response	Community Pasture	Lease
	(percent)	
Strongly agree	7.8	10.9
Agree	82.5	71.1
Disagree	5.6	10.8
Strongly disagree	-	.2
Don't know	4.1	6.4
No response	-	.6
	<hr/>	<hr/>
	100.0	100.0



Table 55

RESPONSE TO STATEMENT THAT ANY INCREASE IN THE GRAZING CAPACITY OF PUBLIC LANDS SHOULD BE OBTAINED BY DEVELOPMENT OF NEW LANDS NOT NOW BEING GRAZED

Response	Community Pasture	Lease
	(percent)	
Strongly agree	3.5	6.9
Agree	71.3	60.9
Disagree	14.4	16.8
Strongly disagree	-	1.4
Don't know	10.8	13.5
No response	-	.5
	<hr/>	<hr/>
	100.0	100.0



Table 56

RESPONSE TO STATEMENT THAT ANY INCREASE IN THE GRAZING CAPACITY OF PUBLIC LANDS SHOULD BE OBTAINED BY BUYING ADDITIONAL PRIVATELY OWNED LAND AND DEVELOP OR IMPROVE ITS GRAZING CAPACITY

Response	Community Pasture	Lease
	(percent)	
Strongly agree	2.8	3.6
Agree	49.5	36.1
Disagree	33.7	40.1
Strongly disagree	3.2	7.6
Don't know	10.8	12.1
No response	-	.5
	<hr/>	<hr/>
	100.0	100.0



Table 57

RESPONSE TO STATEMENT THAT SUPPOSE ONE HALF OF THE BENEFITS FROM INCREASED GRAZING CAPACITY ON PUBLIC LANDS ACCURE TO THE USERS; THEN ONE HALF OF THE COSTS OF DEVELOPMENT SHOULD BE PAID BY THEM \*

Response	Community Pasture	Lease
	(percent)	
Strongly agree	.9	4.7
Agree	64.3	56.1
Disagree	17.8	20.4
Strongly disagree	1.8	3.7
Don't know	14.6	14.6
No response	.6	.5
	<hr/>	<hr/>
	100.0	100.0



Table 58

RESPONSE TO QUESTION: WHAT PROPORTION OF THE PUBLIC GRAZING  
LANDS SHOULD THE PROVINCE SELL?

Response	Community Pasture	Lease
	(percent)	
All	6.8	9.9
Part	15.4	36.0
None	74.4	50.5
No response	3.4	3.6
	<u>100.0</u>	<u>100.0</u>



Table 59

RESPONSE TO QUESTION: WOULD YOU BE INTERESTED IN BUYING AND  
TAKING TITLE TO PUBLIC GRAZING LANDS?

Response	Community Pasture	Lease
	(percent)	
No	34.5	33.5
Yes	63.5	65.3
No response	2.0	1.2
	<hr/>	<hr/>
	100.0	100.0



Table 60

RESPONSE TO QUESTION: IF YOU ARE INTERESTED IN BUYING PUBLIC GRAZING LANDS WOULD YOU ACCEPT A TITLE SPECIFYING THE CONDITIONS OF LAND USE?

Response	Community Pasture	Lease
	(percent)	
No	15.5	21.0
Yes	52.3	44.4
No response	32.2	34.6
	<hr/>	<hr/>
	100.0	100.0



## APPENDIX II



Questionnaire Number

Census Division

Interviewer's Number

THE QUESTIONNAIRE

Economic Efficiency in Pasture Production  
and Improvement in Alberta - Phase II  
The Public Lands

\_\_\_\_\_  
Name of Interviewer

SECTION I - PERSON NOW IN CHARGE

\_\_\_\_\_  
Name

\_\_\_\_\_  
Given names

\_\_\_\_\_  
Office Address

What is the legal location of your headquarters?

Quarter NE, NW, SW, SE.  
Circle One

Section \_\_\_\_\_

Township \_\_\_\_\_

Range \_\_\_\_\_

West of \_\_\_\_\_

What was the year of your birth? \_\_\_\_\_

SECTION II - OWNERSHIP AND TENURE

How many years have you been operating a farm or ranch? (Check one)

(1) 30 or more	<input type="checkbox"/>
(2) 20 - 29	<input type="checkbox"/>
(3) 10 - 19	<input type="checkbox"/>
(4) 1 - 9	<input type="checkbox"/>

How many years have you operated this holding? (Check one)

(1) 20 or more	<input type="checkbox"/>
(2) 15 - 19	<input type="checkbox"/>
(3) 10 - 14	<input type="checkbox"/>
(4) 5 - 9	<input type="checkbox"/>
(5) less than 5	<input type="checkbox"/>



2.

Did you live on this place all year during 1965? No ☐ If no ask how many months did you live on this holding during 1965? (Check one)

(3) Yes ☐

(1) 9 - 12

(2) 5 - 8

(3) 1 - 4

(4) Did not live on this holding

5.

WE NOW WANT TO TALK ABOUT YOUR FARMING AND RANCHING OPERATIONS FOR 1965 WITH RESPECT TO LAND OWNED AND LAND LEASED.

OWNED LAND: How many acres do you own? (Regardless of where located.)

None

☐

6.

acres

LAND RENTED OR LEASED TO OTHERS: (Include land worked on shares by others.)

How many acres that you own do you rent to others?

None

☐

7

acres

Subtracting question 7 from question 6 we get the total acreage owned, and operated by you.

8.

acres

How many acres do you RENT FROM PRIVATE OWNERS: (Include acres worked on shares?)

12-12 ☐

9.

acres

How many acres do you lease from Crown or public sources or others?

None

☐

10

acres

Adding questions 8, 9 and 10 we get. (Total acres in this place)

11.

acres



WE NOW ENQUIRE SPECIFICALLY ABOUT YOUR USE OF LANDS LEASED FROM CROWN OR PUBLIC LANDOWNERS DURING 1965 - Tract by tract beginning with the largest first.

12. Did you lease any lands from the following in 1965?

	Tract 1	An'l cst	Tract 2	An'l cst	Tract 3	An'l cst	Tract 4	An'l cst	Tract 5	An'l ct
(a) Provincial Dept. of Lands & Forests?	12	13	14	15	16	17	18	19	20	21
No <input type="checkbox"/>	crop ac.	an'l cst.	crop ac.		crop ac.		crop ac.		crop ac.	
Yes <input type="checkbox"/>	22	23	24	25	26	27	28	29	30	31
	graz. ac.		graz. ac.		graz. ac.		graz. ac.		graz. ac.	
(b) Provincial Dept. of Municipal Affairs (special areas?)	32	33	34	35	36	37	38	39	40	41
No <input type="checkbox"/>	crop ac.		crop ac.		crop ac.		crop ac.		crop ac.	
Yes <input type="checkbox"/>	42	43	44	45	46	47	48	49	50	51
	graz. ac.		graz. ac.		graz. ac.		graz. ac.		graz. ac.	
(c) Counties, Improve- ment Districts or Municipal Districts	52	53	54	55	56	57	58	59	60	61
No <input type="checkbox"/>	crop ac.		crop ac.		crop ac.		crop ac.		crop ac.	
Yes <input type="checkbox"/>	62	63	64	65	66	67	68	69	70	71
	graz. ac.		graz. ac.		graz. ac.		graz. ac.		graz. ac.	
(d) Federal Gov't i.e. Parks or Indian Reserves or Dept. of Nat. Defense.	72	73	74	75	76	77	78	79	80	81
No <input type="checkbox"/>	crop ac.		crop ac.		crop ac.		crop ac.		crop ac.	
Yes <input type="checkbox"/>	82	83	84	85	86	87	88	89	90	91
	graz. ac.		graz. ac.		graz. ac.		graz. ac.		graz. ac.	
(e) Total acres leased from Public sources & total an'l costs									92	93
	(Total acres must agree with question 10, box 10.)									\$
									Total Lease	Total Cost



3. NOW ENQUIRE ABOUT GRAZING WHICH YOU OBTAINED ON A PER HEAD BASIS PER MONTH OR PER SEASON

To be completed by interviewer

3. In 1965 did you have GRAZING PRIVILEGES from any of the following sources?	No	Yes	Number of head	Class, age i.e. cows, calves, yearlings	No. of months grazed	Total Cost for the season	Total animal unit months by source	Per head cost per A.U.M. by source
a) From private landowners?	<input type="checkbox"/>	<input type="checkbox"/>	94	95	96	97	98	99
b) Grazing lease	<input type="checkbox"/>	<input type="checkbox"/>	100	101	102	103	104	105
c) Community pasture or grazing association. If yes, give Name: _____	<input type="checkbox"/>	<input type="checkbox"/>	106	107	108	109	110	111
d) On a grazing reserve?	<input type="checkbox"/>	<input type="checkbox"/>	112	113	114	115	116	117
e) On a forest reserve?	<input type="checkbox"/>	<input type="checkbox"/>	118	119	120	121	122	123
f) On Indian reserves or Federal Crown Lands?	<input type="checkbox"/>	<input type="checkbox"/>	124	125	126	127	128	129
g) Other Provincial Crown lands? If yes, give name _____	<input type="checkbox"/>	<input type="checkbox"/>	130	131	132	133	134	135
Totals						136	137	138

4. NOW ENQUIRE ABOUT THE LAND USE OF THE TOTAL ACRES IN THIS PLACE DURING 1965

Of the \_\_\_\_\_ in this place, how many did you use for:  
(acreage from box 11 page 2.)

- (a) Hay, silage and green feed →
- (b) Grain and seed →
- (c) Summerfallow →
- (d) Pasture (total of all kinds used solely for grazing) →
- (e) Unused or idle land →

Total must agree with acreage in box 11

Acres	Production in tons or bushels
139	140
141	142
143	
144	
145	
146	

5. NOW ENQUIRE ABOUT GRAZING MANAGEMENT DURING 1965 ON A PASTURE BY PASTURE BASIS.



Table 1. Grazing record for this place during 1965

Name or No. of Pasture	Total acreage by ownership				Acreage by kind of pasture				As a part		No. of AUM (Compute later)
	Acres	Owned	Private Lease	Public Lease	Unimproved Native	Improved Native*	Permanent Tame	of crop Rotation	Hay Land	Aftermath Stubble	
Grazing - 1965 distribution by months	147	148	149	150	151	152	153	154	155	156	
Type and number of animals grazed											
Record of supplemental feed											

Name or No. of Pasture	Total acreage by ownership				Acreage by kind of pasture				As a part		No. of AUM (Compute later)
	Acres	Owned	Private Lease	Public Lease	Unimproved Native	Improved Native*	Permanent Tame	of crop Rotation	Hay Land	Aftermath Stubble	
Grazing - 1965 distribution by months	157	158	159	160	161	162	163	164	165	166	
Type and number of animals grazed											
Record of supplemental feed											

\* Physical or chemical treatment used to improve vegetative cover.



Table 1 cont'd

Grazing record for this place during 1965

Name or No. of Pasture	Total acreage by ownership				Acreage by kind of pasture				As a part				No. of AUM (Compute later)
	Acres	Owned	Private Lease	Public Lease	Unimproved Native	Improved* Native	Permanent Tame	of crop Rotation	Hay Land	Aftermath Stubble			
Grazing - 1965 distribution by months  Type and number of animals grazed  Record of supplemental feed	167	168	169	170	171	172	173	174	175	176			(Compute later)
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
Grazing - 1965 distribution by months  Type and number of animals grazed  Record of supplemental feed	177	178	179	180	181	182	183	184	185	186			No. of AUM (Compute later)
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	

\* Physical or chemical treatment used to improve vegetative cover.



Table 1 cont'd

\*Physical or chemical treatment used to improve vegetative cover.



Table 1 cont'd

Grazing record for this place during 1965

Name or No. of Pasture	Total acreage by ownership				Acreage by kind of pasture				As a part				No. of AUMs (Compute later)
	Acres	Owned	Private Lease	Public Lease	Unimproved Native	Improved Native	* Improved Native	Permanent Tame	of crop Rotation	Hay Land	Aftermath Stubble		
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
Grazing - 1965 distribution by months	207	208	209	210	211	212	213	214	215	216			
Type and number of animals grazed													
Record of supplemental feed													

Name or No. of Pasture	Total acreage by ownership				Acreage by kind of pasture				As a part				No. of AUMs (Compute later)
	Acres	Owned	Private Lease	Public Lease	Unimproved Native	Improved Native	*Permanent Tame	of crop Rotation	Hay Land	Aftermeth Stubble			
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
Grazing - 1965 distribution by months	217	218	219	220	221	222	223	224	225	226			
Type and number of animals grazed													
Record of supplemental feed													

\* Physical or chemical treatment used to improve vegetative cover.



15. How many pastures or pasture tracts were on this place in 1965?

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WE NOW ENQUIRE BRIEFLY ABOUT LIVESTOCK NUMBERS AND VALUE OF LIVESTOCK AND LIVESTOCK PRODUCTS SOLD DURING 1965.

16. How many cattle and calves of all ages were on this place on January 1, 1966.

None

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17. What was the total value of all cattle sold during 1965?

None

229

18. How many ewes, rams, wethers and lambs of all ages were on this place on January 1, 1966.

None

230

19. What was the total value of all sheep sold during 1965?

None

231

20. How many hogs were sold during 1965?

None

232

21. What was the total value of all hogs sold during 1965?

None

233

22. What was the total value of sales of poultry and eggs during 1965?

None

234

23. How many horses, mules, colts and ponies were on this place January 1, 1965.

None

235

24. What was the total value of all horses, mules, and colts sold from this place during 1965.

None

236

25. What was the total value of all dairy products sold from this place during 1965.

None

237

WE NOW ENQUIRE CONCERNING YOUR BEEF CATTLE MANAGEMENT PRACTICES AND YOUR PLANS OR EXPECTATIONS FOR THE NEXT 3 YEARS.

26. Which of these operating adjustments most nearly fit your method of handling year to year variations in pasture production? (Show page as typed below).

(1) \_\_\_\_\_ Buy or sell livestock each year to keep 1/3 - 1/2 of the vegetative cover as a carryover.

(2) \_\_\_\_\_ Plan your livestock program so most of the pasture is used in good years; buy additional roughage in poor years.

(3) \_\_\_\_\_ Plan your livestock program on the basis of average pasture yields. Store surplus feed from good years to use in poor years.

(4) \_\_\_\_\_ Adjust cattle numbers to grain production.

(5) \_\_\_\_\_ Others (specify) \_\_\_\_\_

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27. (a) Do you plan on expanding your livestock operation within the next 3 years?

(6) No ☐ . Yes ☐

- (b) 1) If yes for (a), will the expansion be in

- (1) \_\_\_\_\_ Grazing operations.  
 (2) \_\_\_\_\_ Feedlot operations.  
 (3) \_\_\_\_\_ Holding calves & yearlings over winter.  
 (4) \_\_\_\_\_ Change from sheep to cattle.  
 (5) \_\_\_\_\_ Other (Describe) \_\_\_\_\_

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- 2) Will this expansion during the next three years be:

- (1) \_\_\_\_\_ 10%  
 (2) \_\_\_\_\_ 25%  
 (3) \_\_\_\_\_ 50%  
 (4) \_\_\_\_\_ 100%

☐  
☐  
☐  
☐

240

of present numbers.

- (c) If no for (a) why not?

- (1) \_\_\_\_\_ satisfied with present size of operation.  
 (2) \_\_\_\_\_ additional grazing land not available  
 (3) \_\_\_\_\_ shortage of necessary capital  
 (4) \_\_\_\_\_ low return on investment  
 (5) \_\_\_\_\_ shortage of labour  
 (6) \_\_\_\_\_ others (specify) \_\_\_\_\_

241

28. Is any of your pasture a part of a continuous crop rotation?

(1) No ☐ (2) Yes ☐

- (a) If yes, what portion?

- (1) \_\_\_\_\_ one quarter  
 (2) \_\_\_\_\_ one-half  
 (3) \_\_\_\_\_ three quarters  
 (4) \_\_\_\_\_ all

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243



1. In 1966 do you have:

- (1) \_\_\_\_\_ More  
 (2) \_\_\_\_\_ Less  
 (3) \_\_\_\_\_ The same acreage of pasture as  
 in 1965.

244

2. (a) If more, how was it obtained:

- (1) Lease No. ☐  
 (2) Rent No. ☐  
 (3) Purchase No. ☐  
 (4) Development of idle  
 land No. ☐  
 (5) Increase pasture  
 acreage in the  
 rotation No. ☐  
 (6) Development of  
 irrigated pasture No. ☐

245

246

247

- (b) Per head grazing - number of head ☐ No.  
 number of months ☐ No.

248

3. Concerning the pasture land WHICH YOU OWN and are now using for  
 pasture which two of the pasture improvement practices or treatments  
 listed on this page do you consider most profitable?

(List them in the order of your preference) (SHOW PAGE)

Code from number on the  
 flash card list.

	Treatment	No. of acres it could be applied to
1st Choice	249	250
2nd Choice	251	252

4. (a) Did you use any of these pasture improvement practices  
 on owned grazing lands during 1965?

(1) No ☐ (2) Yes ☐

If yes, which ones?

Code from number on  
 the flash card list.

	Treatment	Number of acres	Total cost
1st	254	255	256
2nd	257	258	259

253

If No to 32 (a) then use flash card for 32 (b).



(b) Why didn't you improve owned pasture land during 1965.

- (1) ☐ Lack of information on costs and benefits
- (2) ☐ More profitable use of capital elsewhere in the business
- (3) ☐ Lack of time
- (4) ☐ All grazing land owned was fully developed in prior years
- (5) ☐ Too risky
- (6) ☐ Could not borrow needed money to do the work
- (7) ☐ Other (specify) \_\_\_\_\_

260

3. Concerning the grazing lands which you are now leasing from CROWN or PUBLIC OWNERS which three practices or treatments listed on this page do you consider most needed to increase carrying capacity?

(list them in the order of your preference) (SHOW PAGE)

No. of acres to which  
it could be applied

Treatment

261

262

263

264

265

266

Code from numbers  
on the flash card)

1st Choice

2nd Choice

3rd Choice

4 (a) Did you complete any of these practices on public grazing lands during 1965?

(1) No ☐ (2) Yes ☐

If yes, which ones?

No. of  
acres

Total  
cost

Treatment

267

268

269

270

271

272

273

274

275

1st

2nd

3rd

Code from numbers  
on the flash card)

(If no to 34 (a) then use flash card for 32 (b).)

(b) Why didn't you improve the Crown grazing lands you used in 1965?

- (1) ☐ As a patron of a grazing association or forest reserve this improvement was not within my jurisdiction.
- (2) ☐ Lack of time
- (3) ☐ Too risky
- (4) ☐ Could not borrow needed money to do the work
- (5) ☐ More profitable use of capital elsewhere in the business
- (6) ☐ Lack of information on costs and benefits
- (7) ☐ Other (specify) \_\_\_\_\_

276



35. During the years 1961 through 1964 what pasture improvement practices did you use on grazing lands which you OWN?

None ☐

(Use the flash card of pasture improvement practices to code his answer.)

1st  
2nd  
3rd

Acres  
treated

277	278
279	280
281	282

36. During the years 1961 through 1964 what pasture improvement practices did you make on PUBLIC LANDS.

None ☐

(Use the flash card of pasture improvement practices to code his answer)

1st  
2nd  
3rd

Acres  
treated

283	284
285	286
287	288

37. How many years have you and your family (including past generations) or your ranching partnership or corporation been using public grazing lands.

289

38. Have you ever tried to borrow money specifically for pasture improvement on private lands?

(1) No ☐ (2) Yes ☐ →

290

(a) If yes, was it obtained? (1) No ☐ (2) Yes ☐ →

291

(b) If yes, was any difficulty encountered? (1) No ☐ (2) Yes ☐ →

292

WE NOW ENQUIRE ABOUT YOUR OPINIONS CONCERNING POLICY AND ADMINISTRATION OF PUBLIC GRAZING LANDS. THESE QUESTIONS COVER LEGAL AND PHYSICAL ASPECTS OF THEIR MANAGEMENT.

39. Do you think the present methods of managing public grazing lands should be changed?

(1) No ☐ (2) Yes ☐ →

293



(a) If yes, to which type of public grazing do you refer? i.e.

- 102 code 2112 (1) Provincial lease ☐
- 243 code 223 (2) Special areas lease ☐
- 314 code 34 (3) Grazing permit in Forest Reserves ☐
- etc or (4) Grazing associations ☐

294

(b) If yes, what specific changes do you suggest? (open end.)

295

296

297

298

299

300

301

(Use flash card and question in obtaining the reply.)

40.

Improvement of the grazing capacity of public lands require at least three factors.

- (1) Money; (2) Equipment and labor to carry out the improvements; and (3) A waiting or development period before the work done actually increases grazing capacity.

HOW WOULD YOU LIKE TO SEE IMPROVEMENTS MADE?

- (1) The provincial government do the work by contract and increase grazing capacity and grazing charge at the end of a development period to cover costs.
- (2) The individual make all investment and do all work and in return be granted incentives or concessions to cover his costs such as decreased charges, extended leases, freedom from leases being cut due to improved grazing capacity - with some specified amount of improvement mandatory in each 4 year period.
- (3) A continuation of the recently announced policy of the Department of Lands and Forests contributing 25 percent of development costs to the individual doing the work in return for specified concessions.



(4) Continue present government policy for range improvement but with larger cash contributions - the individual to do the improvement work in return for lease concessions with some specified amount of improvement mandatory within each 4 year period..

(5) Continue present policy unchanged with no mandatory improvements and few concessions.

302

41. If improvement of the public grazing lands is left to initiative of the individuals using the lands:

(a) should the improvement program be supervised by government official?

No ☐ Yes ☒

303

(b) should some specified amount of range improvement be mandatory wholly at individual user's expense because of the lower charges per animal unit of grazing on public lands? (Compared to private lands.)

No ☐ Yes ☒

304

If no, why not? \_\_\_\_\_

305

42. Would it be in the best interest of society if the Province sold:

(1) ☐ all,

(2) ☐ part, or

(3) ☐ none of the public grazing lands?

306

(a) Would you be interested in buying and taking title to public grazing lands?

(1) No ☐

(2) Yes ☐

307

(b) If yes, to 42 (a) would you accept a title-specifying the conditions of land use?

(1) No ☐

(a) Yes ☐

308



309

43. Do you favor including required improvement practices when renewing a public grazing lease?

(1) No ☐ (2) Yes ☐

44. How many cattle should one individual owner be permitted to graze on the public lands?

(Use agree, disagree flashcard)

45. Grazing capacity of the public land should be increased.

1. ☐ Strongly agree 4. ☐ Strongly disagree  
 2. ☐ Agree 5. ☐ Don't know  
 3. ☐ Disagree

311

46. Any increase in the grazing capacity of public lands should be obtained by

(a) Development of new lands NOT now being grazed.

1. ☐ Strongly agree 4. ☐ Strongly disagree  
 2. ☐ Agree 5. ☐ Don't know  
 3. ☐ Disagree

312

(b) Improvement of lands now being grazed.

1. ☐ Strongly agree 4. ☐ Strongly disagree  
 2. ☐ Agree 5. ☐ Don't know  
 3. ☐ Disagree

313

(c) Buy additional privately owned land and develop or improve its grazing capacity.

1. ☐ Strongly agree 4. ☐ Strongly disagree  
 2. ☐ Agree 5. ☐ Don't know  
 3. ☐ Disagree

314

7. Suppose one half of the benefits from increased grazing capacity on public lands accrue to the users; then one half of the costs of development should be paid by them.

1. ☐ Strongly agree 4. ☐ Strongly disagree  
 2. ☐ Agree 5. ☐ Don't know  
 3. ☐ Disagree

315



48. To be completed by interviewer.

Compute the number of animal unit months of grazing obtained from each pasture tract in Table 1 and enter amount in boxes below.

Pasture number	Total A. U. M.
1	316
2	317
3	318
4	319
5	320
6	321
7	322
8	323
TOTAL	









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